PLANT BREEDING ABSTRACTS

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Plant Breeding Abstracts

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*STATISTICS

799 WISHART, J.
Multivariate analysis.
Appl. Statist. 1955 : **4** : 103–16.

This is an expository article on the more elementary techniques available when observations are made on more than one variable, no one group of which can be considered as dependent on the variables not in the group. The main topic is the generalization of t and F tests.

800 DUNCAN, D. B.
Multiple range and multiple F tests.
Biometrics 1955 : **11** : 1–42.

Consider an experiment, a randomized block design using more than two varieties would be an example, which gives two independent mean squares: one an estimate of the residual variation, and the other expressing the variation between the varieties. Then the usual F test provides a means of deciding if there is reason to suppose any differences between the varieties. In the case where this test is significant there is no generally accepted way of deciding what are the forms of the differences. The present paper provides a way of doing this when n independent normal means, having common standard deviation σ estimated on μ degrees of freedom, are available. The procedure is first described in detail, with the necessary tables provided, and illustrated by an example. There then follows a discussion of the concepts of power and significance level in this situation, a review of other tests that have been proposed, and the paper concludes with some comparisons of these tests with the new one.

801 SCHULTZ, E. F. (JUN.)
Rules of thumb for determining expectations of mean squares in analysis of variance.
Biometrics 1955 : **11** : 123–35.

The case in which all the components are random, and the mixed situation, are both considered and illustrated by examples.

802 IHM, P.
Eine exakte Methode als Ersatz für die Varianzanalyse in bestimmten Fällen. (**An exact method as a substitute for the analysis of variance in certain cases**).
Züchter 1955 : **25** : 365–68.

An exact method, based on Neyman and Pearson's theory of significance tests, is described for determining whether the difference between any two treatment means in an experimental design is significant or not.

803 LAWRENCE, W. J. C.
Techniques for experiments with pot plants.
Plant & Soil 1955 : **6** : 332–46.

Simple, standardized techniques for raising pot plants in the glasshouse are described which are suitable for use in the statistical analysis of quantitative and qualitative variations in plant populations.

804 ALVEY, N. G.
Error in glasshouse experiments.
Plant & Soil 1955 : **6** : 347–59.

The average size of the errors occurring in experiments involving the techniques noted in Abst. 803 is estimated and methods of minimizing the error are suggested. The numbers of replications needed to obtain results of a stated accuracy are indicated.

RUNDFELDT, H.
Über die Auswertung von Blockversuchen. (**On the evaluation of block trials**).
Züchter 1955 : **25** : 252–55.

The effect of block shape and arrangement in field trials is discussed. The author recommends arranging the plots in a single row so that a correction factor for systematic soil differences calculated from the block means can be applied to the individual plot yields.

* General studies, see also individual crops.

806 BAPTISTA, J. G.
Estudos de estatística aplicada. I. Quadrado Latino com dois talhões falhados. (**Studies on applied statistics. I. Latin squares with two missing plots**).
Melhoramento 1954 : **7** : 5–27.

The analysis of Latin square trials in which there are two missing plots is described, formulae being given for estimating the yield of the missing plots and the standard error of comparisons in which the missing data are involved. Examples are worked out from a trial of optimum cutting date in *Vicia sativa* and of yield of green matter in mixtures of *Trifolium alexandrinum* and *Lolium multiflorum*.

807 FINNEY, D. J.
International biometric symposium in Brazil.
Nature, Lond. 1955 : **176** : 1058–59.

The above symposium was held at Campinas, Brazil, during 4–9 July 1955. The following contributions are of special interest to plant breeders: R. Fisher, on biometry and plant improvement, and on the analysis of genetic models involving numerous factors; F. G. Brieger, on the biometrical genetics of autogamic populations; S. C. Pearce, on layouts for perennial crops; E. Amaral on missing plots in sugar-cane trials; A. Conagin and Fraga, on the analysis of coffee trials; and G. M. Cox on the theory of experimental designs, with special reference to rotatable designs.

808 ROD, J.
Diagramy nejmenších průkazných rozdílů mezi zkoušenými členy v polním pokuse, založeném v namátkových dílcích a řešeném analysou rozptylu. (**Graphs of minimum significant differences between tested varieties in a field trial arranged in randomized blocks and carried out by analysis of variance**).
Sborn. čsl. Acad. zeměd. 1955 : **28** : 607–24.

Minimum significant differences (d) between average yields in randomized-block layouts are calculated for $s^2 = 0{\cdot}30$, $v = 5$–15, $n = 3$–6 and $P = 0{\cdot}05$, where s = the standard deviation, v = the number of varieties and n = the number of blocks. Curves of s^2 against d for selected combinations of v and n are plotted.

809 STEEL, R. G. D.
An analysis of perennial crop data.
Biometrics 1955 : **11** : 201–12.

The techniques of a bivariate analysis of variance are illustrated by application to a randomized block experiment with 25 varieties of lucerne; the two measurements made on each plot are the yields for two successive years. The following analyses are performed: calculation of the sufficient statistics, an overall U-test between varieties, the analysis of variance with years as a factor, the canonical correlations, and the canonical variates and other transformations. Finally, there is a brief interpretation of the data in the light of the analyses.

810 RIVES, M.
Méthodes d'analyse pour des essais incomplets. (**Methods of analysis of incomplete trials**).
Ann. Inst. nat. Rech. agron., Paris 1955 : Sér. B : **5** : 103–18.

Methods suitable for analysing randomized-block trials with one or more missing plots and Latin squares with missing plots or rows are outlined. Examples are worked out with reference to two trials of rape.

811 STRAND, L.
Plot sizes in field trials.
Z. Forstgen. Forstpflanzenz. 1955 : **4** : 157–62.

From an analysis of Norwegian trials of spruce it was discovered that the optimum plot size for natural stands was 10 x 20 m. while for plantations, in which the trees are more evenly distributed, plots 10 x 10 m. suffice. If isolation strips are used, rather larger plots will be required. Border effects, except on the outside of a stand, or between plots with extreme differences in growth rate, are not likely to be large.

*GENETICS

812 DURRANT, A.
Genetics, east and west.
J. agric. Soc. Univ. Coll. Wales 1955 : **36** : 21–24.

The view is expressed that although the validity of Mendelian principles cannot be denied, some of the findings of the Lysenkoists are of potential value. The author refers briefly to some results which are regarded as lending support to the view that environmental factors influence succeeding generations. In intervarietal crossing of flax, seeds from untrimmed branches produced

* General studies, see also individual crops.

plants 9% shorter at flowering time than those from seeds from trimmed branches. In *Drosophila*, changes in the physiological activity induced in the parents by environmental conditions have affected the next generation. These results were obtained at the University College of Wales.

813 HAYMAN, B. I., & MATHER, K.
The description of genic interactions in continuous variation.
Biometrics 1955 : **11** : 69–82.

The effect of a single gene pair on the phenotype requires two parameters for its specification, for example d, the phenotypic difference between the homozygotes, and h, the departure of the heterozygote from the midpoint between AA and aa (cf. *PBA**, Vol. XIX, p. 913). To specify the phenotype when two pairs of genes are involved, the authors propose the use of four interaction parameters, i_{ab}, the interaction of d_a and d_b; j_{ab} and j_{ba}, the respective interactions of d_a and h_b and of d_b and h_a; and l_{ab}, the interaction between h_a and h_b. These parameters, together with d_a, d_b, h_a and h_b, enable the phenotypes corresponding to digenic differences to be completely specified. The application of these parameters in analysing F_2 and F_3 segregation data is discussed.

814 WRICKE, G.
Über die Methoden zur Untersuchung der Wirkungsweise quantitativer Gene. (**On methods of investigating the mode of action of quantitative genes**).
Züchter 1955 : **25** : 262–74.

The literature on quantitative inheritance is reviewed with special reference to heterosis. A series of mathematical formulae is also provided to assist the breeder in selecting for a character that is polygenically determined.

Symposium on genetic recombination given at research conference for biology and medicine of the Atomic Energy Commission, held at Oak Ridge, Tennessee, April 19-21, 1954.
J. cell. comp. Physiol. 1955 : **45** : Suppl. 2 : Pp. 321.

The following papers are of special interest for plant breeders:—

815 *Hotchkiss, R. D. Bacterial transformation. (pp. 1–22).*

After outlining the evidence for the view that factors for streptomycin resistance (*S*) and the ability to utilize mannitol (*M*) are linked within the same DNA particle (cf. *PBA*, Vol. XXV, Abst. 703), the sequence of events which appears to take place after transferring DNA carrying a marker for drug resistance from a donor to a recipient strain is described. Shortly after introduction of the marked DNA, a sudden increase in the drug resistance of the cell population occurs. This is followed by a lag period during which it seems that the foreign material is being incorporated into the genome of the recipient; at this stage drug resistance is unequally distributed to the daughter cells of the resistant cells, so that mixed clones are produced. Later, when the marked DNA is apparently completely incorporated, pure resistant clones can be obtained. There is evidence that the ability of the recipient cell to respond to transforming factors is to some extent dependent upon the stage of the division cycle.

816 *Zinder, N. D. Bacterial transduction. (pp. 23–49).*

Experiments on the incorporation of markers from *Salmonella typhimurium* into phage PLT–22 show that the amount of material incorporated is influenced by the medium of growth, medium of lysis and temperature. The time taken for the ratio transduction/phage to reach its maximum differs for each marker studied, the order in which the markers are incorporated remaining constant under different physiological conditions; this is taken to indicate that the loci lie on a structure such as a chromosome which can be broken down in linear sequence.

817 *Doermann, A. H., Chase, M. & Stahl, F. W. Genetic recombination and replication in bacteriophage. (pp. 51–74).*

Cells of *Escherichia coli* strain B were simultaneously infected with wild-type phage (T2 or T4), previously exposed to ultraviolet radiation, and phage carrying mutant genetic markers. Analysis of the contents of burst cells showed that (1) a given marker originally present in the irradiated parent may be absent from a burst although the other markers may be present in appreciable frequency; (2) linked markers tend to be inactivated simultaneously and unlinked markers independently; and (3) a marker linked to another which is absent from a burst occurs less frequently in the burst than an independent marker. The probability of survival of a given marker appears to decrease logarithmically with dose. The results are held to be compatible with the view that damage caused by irradiation is located in the genetic structure and that loci

are rescued from damage by genetic recombination. It is suggested that the undamaged part of the irradiated phage multiplies but the damaged part does not, so that partial replicas of the linkage groups are formed which enter the vegetative phase and attach themselves to complementary genetic structures before becoming incorporated into infectious phage.

818 *Lederberg, J. Recombination mechanisms in bacteria.* (*pp. 75–107*).

A classification of recombination mechanisms in bacteria is presented in which the following categories are distinguished: (1) caryogamy and (2) heterocaryosis, both involving the transfer of the intact nucleus; (3) genetic transduction, in which a nuclear fragment is transferred; (4) lysogenic conversion, in which a phage nucleus is transferred; (5) cytoplasmic transfer; and (6) a hypothetical category in which the unit transferred is an intact chromosome. After a brief discussion of three possible means by which transduced fragments are incorporated in the recipient, *viz.* physical breakage of the chromosome, differential joining and differential replication, some recent work on sexuality in *Escherichia coli* is outlined (cf. *PBA*, Vol. XXV, Abst. 702) and researches on *Salmonella* are described (cf. *PBA*, Vol. XXIV, Abst. 1642). From a mixture of nonmotile *Salmonella* cells and an appropriate phage, motile cells have been isolated, 10–20% of which die before producing sizeable clones, while 5–10% give clones containing 25–100% of motile cells; of the remainder, each cell gives rise during the first few divisions to numerous motile cells, after which the motility factor is transmitted to only one daughter cell in each division, forming a line referred to as a semiclone. Motility generally ceases after 20–30 fissions in a semiclone. Three possible explanations of these results are suggested: (1) the semiclones result from the transduction of aborted genes with a limited capacity for irregular replication; (2) the semiclones are produced by the action of functional but nonreproducing genes, a high degree of polyteny occurring in the bacterial chromosome such that early divisions serve to distribute the units to the progeny; and (3) the transduced units are not genes but the primary products of genes organized in complex bundles.

819 *Watson, J. D. Biological consequences of the complementary structure of DNA.* (*Abst.*). (*pp. 109–18*).

The substance of this paper has been summarized in *PBA*, Vol. XXIV, Absts. 57–58.

820 *Perkins, D. D. Tetrads and crossing over.* (*pp. 119–49*).

Data derived from tetrad analysis in *Neurospora* and other organisms indicate that chromatid interference occurs occasionally but does not account for wide deviations from expected ratios and that sister-strand exchanges do not participate in chiasma interference to the same extent as nonsister exchanges.

By means of a hypothetical model of crossing over in which three variables, chiasma interference, chromatid interference and sister strand crossing over, are taken into account and in which the assumptions are made that crossing over occurs at the four-strand stage, that nonexchanges are not excluded for any interval between loci, and that the intervals contain no discontinuities such as centromeres or points of chiasma formation, the frequencies of tetratype or second-division segregation in tetrads and the recombination frequencies in single strands are predicted. It is suggested that these theoretical values may be tested by tetrad analysis in *Neurospora, Saccharomyces, Chlamydomonas* and *Sphaerocarpus.*

821 *Schwartz, D. Studies on crossing over in maize and* Drosophila. (*pp. 171–88*).

Studies of ring chromosomes in maize and attached-X chromosomes in *Drosophila melanogaster* afford evidence of crossing over between sister strands. It is suggested that during chromosome duplication a new chromatid is formed on a template provided by the parent chromosome (cf. *PBA*, Vol. XXV, Abst. 649) and that meiotic crossing over involves exchanges between the new chromatids and sister chromatids. The experiments further indicate that somatic crossing over is limited to exchanges between the new chromatids. A model of chromosome structure and duplication based on the Watson-Crick model for DNA (cf. *PBA*, Vol. XXV, p. 452) is proposed.

822 *Sax, K. Evaluation of recombination theory.* (*pp. 243–47*).

Problems arising from the foregoing papers are indicated and briefly discussed. The author considers it difficult to reconcile the observed precision of genetical crossing over with the view that chromatid breakage and reunion are caused by stresses acting on the chromosomes. The random crossing over occurring between chromatids of homologous chromosomes, the nature of the broken ends of chromosomes and the mechanism by which foreign DNA is

incorporated into the recipient genome in transduction experiments are also regarded as being in need of further elucidation.

823 *Weinstein, A. Unraveling the chromosomes.* (*pp. 249–69*).

The relative importance in cell division of rigidity of chromosomes, friction between chromatids, system of coiling and number of points on the strands at which separating forces are applied is discussed. It is suggested that at meiosis, because of the complications arising from the presence of four strands and from crossing over, unravelling requires nonrigidity of the chromosomes and/or the occurrence of sister-strand exchanges. Analysis of data from *Drosophila* indicates that chromatid interference does not occur in the majority of cases and that regional interference occurs only for internode lengths of up to 40 cross-over units, above which length inclusive coincidence remains constant at a value of about 1·0. It is shown that sister-strand exchanges can affect the ratios between regressive (2-strand), progressive (3-strand) and digressive (4-strand) exchanges, producing a random from a non-random ratio or the reverse.

824 *Giles, N. H. The oxygen effect on radiation-induced chromosome aberrations: breakage-versus-recombination hypotheses.* (*pp. 271–94*).

The results of earlier work (cf. *PBA*, Vol. XXIII, Absts. 858–59 and 861) are quoted as evidence for the view that oxygen increases the frequency of chromosomal aberration under X irradiation by virtue of its effect on initial chromosome breakage rather than by its influence on recombination of the broken ends. In *Tradescantia*, when oxygen is present during X irradiation of the microspores, aberrations are more frequent at high than at low temperatures, whereas when oxygen is absent the reverse is true. Rapid changes in temperature following irradiation in either oxygen or nitrogen are apparently without effect on aberration frequency. These results indicate that temperature also exerts its influence during irradiation, while breakage is taking place, rather than after, when most of the recombination is supposed to occur. The author concludes by observing that the breakage and recombination hypotheses are not, however, mutually exclusive.

825 *Swanson, C. P. The oxygen effect and chromosome breakage.* (*pp. 285–98*).

The results and conclusions reported in *PBA*, Vol. XXV, Abst. 2683 are described and discussed. In addition to the explanations given previously, it is suggested that the different relative frequencies of chromatid and isochromatid deletions induced by ionizing radiation in air and nitrogen may be partly caused by the lesser ionizing effect of the terminal part of an electron track in nitrogen than in air.

826 *Discussion.* (*pp. 309–16*).

In the subsequent discussion, A. D. Conger reported that in *Tradescantia* the frequency of fusion of the broken ends of isochromatids is the same whether irradiation is carried out in oxygen or in nitrogen, while that of chromatids is less in nitrogen, a result which is not in agreement with the hypothesis that aberration frequency increases as a result of the depressive action of oxygen on reunion.

H. B. Glass stated that he had found a decided oxygen effect on interchromosomal exchanges but only a very slight one in interchromosomal breakage and restitution in *Drosophila*.

827 Michie, D. & McLaren, A.
The importance of being cross-bred.
New Biol. 1955 : No. 19 : 48–69.

With examples drawn from experimental work on genetic and environmental variation in inbreds and hybrids of various cross-breeding organisms, the following thesis is developed. For characters physiologically correlated with fitness, interstrain hybrids are more uniform than the parental strains. Distinguishing between monotelic characters, which have an optimum fixed value for any one organism irrespective of environment, and polytelic characters, for which the optimum value varies according to environmental conditions, it is suggested that in interstrain hybrids, the mean value of a monotelic character will respond less to an environmental change than in the parental inbreds, while that of a polytelic character will respond more.

828 Jinks, J. L.
A survey of the genetical basis of heterosis in a variety of diallel crosses.
Heredity 1955 : 9 : 223–38.

Analyses of published data on diallel and other crosses in maize, flax, egg plant, *Galeopsis* spp. and *Nicotiana rustica* have shown that wherever overdominance occurs there is also interaction between nonallelic genes. Reanalysis of the data after omitting all crosses showing significant nonallelic interaction led in all cases to a drop in the apparent degree of overdominance and in one case to the complete disappearance of overdominance. Specific combining ability

was always associated with the occurrence of nonallelic interaction while general combining ability was the result of simple dominance.

829 Sakai, K. & Suzuki, Y.
Studies on competition in plants. V. Competition between allopolyploids and their diploid parents.
J. Genet. 1955 : **53** : 585–90.

Investigations were carried out on (1) *Hibiscus* (*Abelmoschus*) *glutino-textilis* ($n = 96$), the amphidiploid of *H. manihot* x *H. esculentus*, (2) *Nicotiana diplumbalata* ($n = 19$), the amphidiploid of *N. alata* x *N. plumbaginifolia*, and (3) *Triticale* ($n = 28$). The *Nicotiana* and *Hibiscus* amphidiploids were superior to either of their respective parents, as shown by plant weight in the former amphidiploid and plant weight and capsule number in the latter. *Triticale* was competitively superior to its *Triticum vulgare* parent but inferior to rye in respect of plant weight, head number and kernel production. The evolutionary significance of these results is briefly discussed.

830 Kempthorne, O.
The correlations between relatives in inbred populations.
Genetics 1955 : **40** : 681–91.

Formulae are given for the covariance between full sibs and between parents and offspring after n generations of full-sib mating following an initial random mating in a population varying in respect of a single pair of alleles. The full-sib covariance depends on all the latent roots of the generation matrix; the parent-offspring covariance depends on all the latent roots except $\lambda = \frac{1}{4}$.

831 Michaelis, P.
Modellversuche zur Plastiden- und Plasmavererbung. (**Model experiments on plastid and plasmic inheritance**).
Züchter 1955 : **25** : 209–21.

Model experiments that allow plastid, chondriosome, spherosome and cytoplasmic categories of maternal inheritance to be distinguished are described. It was shown that maternally-determined leaf variegations in *Epilobium albomaculatum* are probably due to hereditary factors carried by the spherosome or chondriosome.

832 Ephrussi, B. & Slonimski, P. P.
Subcellular units involved in the synthesis of respiratory enzymes in yeast.
Nature, Lond. 1955 : **176** : 1207–08.

A discussion is given of the problem of the possible identity of the cytoplasmic units determining respiration-deficient mutants with the mitochrondia and other visible particles in the cell or with the sedimentable fraction of these particles.

833 Yotsuyanagi, Y.
Mitochrondria and refractive granules in the yeast cell.
Nature, Lond. 1955 : **176** : 1208–09.

Respiration-deficient mutants were found to contain mitochrondria lacking cytochrome c oxidase but morphologically resembling those of normal yeast (cf. Abst. 832).

834 Robertson, A.
Prediction equations in quantitative genetics.
Biometrics 1955 : **11** : 95–98.

"The basic prediction equation of quantitative genetics (that of breeding value on performance) is derived from the point of view of the combination of information from different sources. The principle is extended to several other prediction equations in family selection and progeny testing." [Author's summary]

835 Lowry, D. C.
Variance components with reference to genetic population parameters.
Biometrics 1955 : **11** : 136–48.

This review paper is divided into two parts. In the first there is a discussion of the genetical assumptions underlying the variance component model used by animal and plant breeders in studying the variation in a metric trait, in particular the effect of nonadditive gene action. The second part reviews the statistical techniques available.

836 Reeve, E. C. R.
The variance of the genetic correlation coefficient.
Biometrics 1955 : **11** : 357–74.

A formula is developed for the variance of the genetic correlation coefficient in large samples when estimated from the four parent-offspring covariances for the two characters. The effects of selection and assortative mating of parents, and of variable family size, are considered.

837 Crow, J. F. & Morton, N. E.
Measurement of gene frequency drift in small populations.
Evolution, NY 1955 : **9** : 202–14.

The mean square charge due to dispersive factors (V_{sq}) in the Fokker-Planck equation

for the distribution of gene-frequency probabilities is given by

$$V_{Sq} = \frac{9\,(1-9)}{4N}\left[[1 - F' + (1 + F')\,\frac{V_k}{\mu_k}\right]$$

where q = gene frequency, F' = the inbreeding coefficient of the parent generation, N = total progeny number, and V_k and μ_k are the variance and mean respectively of the number of progeny per parent. Analogous formulae are given for polysomic and sex-linked loci. The ratio V_k/μ_k is highly dependent on μ_k; when adjusted on the basis of a suitable model to the expectation of the value for $\mu_k = 2$, the ratio becomes relatively constant in such diverse organisms as *Drosophila*, *Lymnaea* and man.

838 KIMURA, M.
Solution of a process of random genetic drift with a continuous model.
Proc. nat. Acad. Sci. USA 1955 : **41** : 144–50.

A complete solution, based on the moments of distribution and the appropriate Fokker-Planck equation, is presented for the process of random genetic drift with a continuous model (cf. *PBA*, Vol. XXV, Abst. 37). Graphs for the change in the probability distribution of heteroallelic classes due to random sampling in reproduction are given for initial gene frequencies of 0·5 and 0·1. The curve of the distribution of the unfixed classes becomes almost flat after 2 N and 4–5 N generations respectively, N representing effective population size.

839 SCARASCIA, G. T.
Energia atomica ed agricoltura. (**Atomic energy and agriculture**).
Ital. agric. 1955 : **92** : 727–37.

In discussing the application of atomic energy to agriculture as a whole, reference is made to some of the valuable mutants in agricultural plants reported at the International Conference on the Uses of Atomic Energy held at Geneva during 8–20 Aug. 1955 and to some results obtained by the author at the Istituto Scientifica sperimentale per i Tabacchi [Tobacco Research Institute] in Italy. These include leaf mutations and meiotic disturbances in plants of *Nicotiana tabacum* arising from seeds treated with slow neutrons from a nuclear reactor or with γ rays from Co^{60}.

840 D'AMATO, F.
Cytological and genetic effects of acridines.
Acta radiol., Stockh. 1954 : 701–02.

The substance of this communication has been summarized in *PBA*, Vol. XXIII, Abst. 1627 and Vol. XXIV, Abst. 75.

841 MACFARLANE, E. W. E. & MESSING, A. M.
Shoot chimeras after exposure to mercurial compounds.
Bot. Gaz. 1954 : **115** : 66–76.

A full account is given of the work on *Raphanus*, *Zea*, *Ruppia*, *Coleus* and *Anacharis* (*Elodea*) reported in *PBA*, Vol. XX, Abst. 1356.

842 GLUSHCHENKO, I. [GLUŠČENKO, I. E.]
Centenary of birth of Ivan Michurin.
Soviet News 1955 : No. 3281 : 2–3.

A brief outline of Mičurin's achievements and of the theories associated with him is given. Mention is also made of Mičurinist research in other countries, in particular France and Japan.

843 LYSENKO, T. D.
(**To the continued progress of Mičurinist science**).
Agrobiologija (Agrobiology) 1955 : No. 4 : 3–6. [Russian].

A brief account of Soviet Darwinism, including inheritance of acquired characters, vegetative hybridization and evolution by interspecific conversion, is presented on the occasion of the centenary of Mičurin's birth.

844 GONČARIK, M. N.
(**Falsification of Mičurin's theory**).
Agrobiologija (Agrobiology) 1955 : No. 4 : 391–94. [Russian].

An article by Lavrik (cf. *PBA*, Vol. XXV, Abst. 2321) is criticized for its criticism of the Mičurinist thesis that changes produced by vegetative hybridization are heritable.

845 LYSENKO, T. D.
(**Soil nutrition of plants**).
Agrobiologija (Agrobiology) 1955 : No. 5 : 3–20. [Russian].

The article, dealing mainly with soil fertilizers, refers incidentally to interspecific conversions said to occur in higher plants and micro-organisms.

846 LYSENKO, T. D.
(**To further progress of Mičurin's theory**).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) 1955 : Ser. biol. : No. 5 : 3–6. [Russian].

The substance of this article is the same as that summarized in Abst. 843.

847 MORTON, A.
(A tribute to I. V. Mičurin).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) 1955 : Ser. biol. : No. 5 : 145–46; and Agrobiologija (Agrobiology) 1955 : No. 5 : 21–22. [Russian].

Mičurin's dicta on the effect of environment upon heredity and the methods he developed for producing directed changes in plants are regarded as his major contributions to biology.

848 PATRUSEVIČ, K.
(I. V. Mičurin, the founder of creative Darwinism).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) 1955 : Ser. biol. : No. 5 : 147–51. [Russian].

Mičurin and Lysenko are thought to have purified evolutionary theory from its Neo-Darwinist and Morganist content and to have stimulated modern research on evolutionary problems.

849 VARUNCJAN, I.
(An eminent biologist and materialist).
Socialist. Seljsk. Hozjaĭstvo (Socialist. Agric.), Moscow 1955 : No. 7 : 20–25. [Russian].

Mičurin's outlook on Darwinism and genetics and the principal methods Mičurin used to obtain directed changes in plants are outlined.

850 LI, C. C.
The stability of an equilibrium and the average fitness of a population.
Amer. Nat. 1955 : **89** : 281–95.

The nature of the equilibria attained in Mendelian populations under given selective conditions is elucidated. The cases considered are two alleles with constant selective values, multiple alleles, differential local selection, variable selective values, populations with inbreeding and mutating populations. It is thought that the criticisms made by Cain and Sheppard of the mathematical theory of natural selection are based on a misapprehension as to the connotation of such terms as "adaptation" in mathematical analyses of the mode of action of natural selection.

EVOLUTION

851 BORROR, D. J.
An outline of the process of organic evolution.
Ohio J. Sci. 1955 : **55** : 321–28.

The author gives a general neo-Darwinian discussion of (1) the nature and origin of the genetic changes forming the basis of evolution (2), the effects of genetic drift, selection and isolation in determining evolutionary trends and (3) rates of evolution.

852 MANI, M. S.
Organic evolution.
Agra Univ. J. Res. 1953 : **2** : Pt. I : 83–111.

MANI, M. S.
Organic evolution: some additional notes.
Ibid. 1954 : **3** : Pt. I : 95–108.

Regarding the environment as playing the primary role in evolution and ontogeny and stressing the importance of considering the organism as a functionally integrated whole, the author advances many general arguments in favour of his view that the findings of modern genetics and other branches of biology should be comprehensively examined on a Lamarckian basis.

853 BARBER, H. N.
The natural history of natural selection.
Aust. J. Sci. 1955 : **17** : 196–97.

The experimental approach to the study of adaptive gene distributions and their physiological and ecological significance are briefly discussed.

854 DUBININ, N. P.
(Errors concerning the problem of the origin of species).
Bjull. Mosk. Obšč. Ispyt. Prirod. (Bull. Moscow Soc. Nat.) 1955 : **60** : 97–107. [Russian].

Lysenko's theory of evolution, which is compared to Goldschmidt's hypothesis of preadaptation and macromutation, is rejected on the ground that it substitutes such metaphysical concepts as leaps and interspecific conversions for the materialist principles inherent in Darwin's theory.

855 YČAS, M.
A note on the origin of life.
Proc. nat. Acad. Sci. USA 1955 : **41** : 714–16.

It is suggested that life may have arisen through the natural selection of reciprocally catalysing organic reactions in the primitive ocean. The first form of "life" would therefore be the "metabolizing ocean" whence, by the development of peptide catalysts and their agglomeration, the emergence of discrete organisms may be envisaged.

*CYTOLOGY

856 Eliseev, V. G.
(The modern concept of the cell theory).
Uspehi Sovrem. Biol. (Advanc. in Mod. Biol) 1955 : **39** : 328–50. [Russian].
Various concepts of the cell from 1844 onwards are briefly surveyed and the Soviet view, which emphasizes the importance of both cellular and noncellular structures, is expounded.

857 Grunberg-Manago, M., Ortiz, P. J. & Ochoa, S.
Enzymatic synthesis of nucleic acid-like polynucleotides.
Science 1955 : **122** : 907–910.
Artificial polynucleotides have been synthesized by the action of a polynucleotide phosphorylase isolated from *Azotobacter vinelandii* on mixtures of 5′-nucleoside diphosphates. The polynucleotide derived from mixtures of the 5′-diphosphates of adenosine, guanosine, uridine and cytidine appeared to be indistinguishable from RNA.

858 Olszewska, M. J.
Obserwacje nad wpływem głodzenia na jądro i jąderko u *Lupinus albus* L. i *Lupinus luteus* L. (**Observations on the influence of starvation on the nucleus and nucleolus in *L. albus* L. and *L. luteus* L.**).
Acta Soc. Bot. Polon. 1955 : **24** : 647–62.
The following starvation effects were shown to occur in *L. albus* and *L. luteus*: (1) a decrease in the number of euchromocentres in the nuclei of all the tissues examined; (2) a diminution in size of nuclei and nucleoli, the latter finally disappearing completely in some cases; (3) vacuolization and decrease in chromaticity in the nucleus and nucleolus; (4) disappearance of RNA from the nucleolus and a slight decrease in DNA content, and (5) amitotic nuclear division in the vascular cambium of the hypocotyl. Treatment with a solution of the sodium salt of α-naphthylacetic acid for five hours or longer after a 15-day period of starvation resulted in the appearance of stages resembling prophase in the root and stem apices; the methyl ester was without effect.

859 Battaglia, E.
Chromosome morphology and terminology.
Caryologia 1955 : **8** : 179–87.
The author defines the following: the centromere, arm, types of centromere according to position, types of chromosomes differentiated by the situation of the centromere, satellites and, lastly, the pseudosatellite, defined here as a spheroidal part of the chromosome adjacent to the centromere.

860 Koopmans, A.
Chromosoomonderzoek na 1935. (**Research on chromosomes since 1935**).
Vakbl. Biol. 1955 : **35** : 137–51.
This article is the sequel to that summarized in Abst. 51 and deals with the chemical structure of the nucleus, chromosome and gene, the mechanism of cell division, the role played by deoxyribose nucleic acid, the function of the chromomere and the nature of the protoplasm and its derivatives.

861 Colombo, G.
Sulla struttura microscopica dei cromosomi. (**On the microscopic structure of the chromosomes**).
Experientia 1955 : **11** : 333–39.
Theories relating to the spiral structure of the chromosomes and chromatids are reviewed. Evidence has been obtained from the author's investigations of gametogenesis in *Anacridium* that the chromatids are wound in a persistent paranemic minor coil.

862 Levine, R. P.
Cations in chromosome structure: Their relation to the mechanism of crossing over.
Genetics 1955 : **40** : p. 582. (Abst.).

Levine, R. P.
Chromosome structure and the mechanism of crossing over.
Proc. Nat. Acad. Sci. USA 1955 : **41** : 727–30.
In feeding experiments on *Drosophila* excess of Ca ions led to decreased frequency of crossing over but addition of a chelating agent to the diet resulted in an increased frequency. These results suggest that genetic exchanges occur at sites where Ca ions are bound by chelation into the structure of the chromosome.

863 Darlington, C. D.
The chromosome as a physico-chemical entity.
Nature, Lond. 1955 : **176** : 1139–44.
The substance is given of a paper presented to the chemistry section of the British Association meeting at Bristol on 1 September 1955. Recent investigations are discussed under the

* General studies, see also individual crops.

following headings: deoxyribonucleic acid and protein spiralization, polynemy, reproduction, meiosis, free deoxyribonucleic acid, and cell and nucleus.

864 Gamow, G.
Information transfer in the living cell.
Sci. Amer. 1955 : **193** : No. 4 : 70–78.
A popular account is given of the author's theory that the sequence of aminoacids in enzymes is built up on a RNA template, itself a derivative of the twin-helical DNA template postulated by Watson and Crick (cf. *PBA* XXIV, Absts. 57–58 and Vol. XXIV, Abst. 1592). It is believed that each aminoacid corresponds to a particular triplet of contiguous nucleotides.

865 Platt, J. R.
Possible separation of intertwined nucleic acid chains by transfer-twist.
Proc. nat. Acad. Sci. USA 1955 : **41** : 181–83.
A possible method whereby the component strands in the twin-helical model of DNA proposed by Watson and Crick (cf. *PBA*, Vol. XXIV, Absts. 57–58) could separate during replication is considered. It is suggested that the two strands become pulled apart at their mid point, each rotating and generating a transfer twist around itself. This process would require only very little in the way of energy.

866 Lockingen, L. S. & DeBusk, A. G.
A model for intracellular transfer of DNA (gene) specificity.
Proc. nat. Acad. Sci. USA 1955 : **41** : 925–34.
The following hypothesis for the transfer of specificity from DNA to RNA is suggested. One of the "minimum chemical units" believed by Dekker and Schachman to compose the twin helix of DNA (cf. *PBA*, Vol. XXIV, Absts. 57–58 and Vol. XXV, Abst. 1553) is thought to become detached from the main helix, probably remaining attached hinge-wise at one end. Ribose nucleosides then enter the gap and become phosphorylated and esterified to form a RNA unit whose structure is determined by the DNA counterpart. The RNA is then ejected and after combination with other such units acts as a template for protein synthesis.

867 Battaglia, E.
New symbols in cytology.
Phytomorphology 1955 : **5** : 171–72.
The author proposes the use of the following symbols to indicate categories of chromosome number; z, zygotic number; g, gametic number; r, reduced number; and $2r$, $<r$, $>r$ and $>2r$ and so on for unreduced, hyporeduced, hypounreduced and hyperunreduced numbers respectively.

868 Mameli Calvino, E. G.
Correlazione tra corredo cromosomico e dimensioni delle microspore nella tassonomia botanica. Spettro genetico dei pollini. (**The correlation between chromosome number and the dimensions of the microspores in botanical taxonomy. The genetic spectrum of the pollen grains**).
Nuovo G. bot. ital. 1954 : **61** : 327–38.
An investigation into the diameter of the pollen grain and chromosome number of some thousand angiosperm species has shown that these two characters are frequently positively correlated, especially when related elementary diploid species are concerned. Polyploid series tend to provide an exception.
The term "genetic spectrum of the pollen grains" is proposed for the range of pollen types commonly encountered in hybrids and other anomalous cases.

869 Schwartz, D.
Speculations on gene action and protein specificity.
Proc. nat. Acad. Sci. USA 1955 : **41** : 300–07.
Gamow's theory (cf. *PBA*, Vol. XXIV, Abst. 1592 and Vol. XXVI, Abst. 864) of the relation between the sequence of nucleotide bases in nucleic acid and the aminoacid sequence in proteins imposes restrictions on the aminoacid sequence which appear to be contradicted by chemical analysis. The author modifies the theory therefore to apply to the aromatic aminoacids only. It is suggested that phenylalanine and tyrosine are formed between adjacent pyrimidine bases and tryptophane and histidine between two purine groups. This theory accounts for the distribution of tyrosine, histidine and tryptophane in insulin fractions A and B and in B-corticotropin, but to account for phenylalanine it is necessary to postulate that protein synthesis is initiated alongside one of the twin-helical strands of DNA and that it is switched to the other when a single phenylalanine group has been formed.

870 Wada, B.
Some problems on the mitotic figures studied in the living cell.
Caryologia 1955 : **7** : 389–403.
The author gives reasons for concluding that

the atractoplasm or spindle body has a phase boundary during mitosis and for regarding this body as consisting of three components: (1) chromosomal fibres connecting the centromere of each chromosome with the poles, (2) orientated protein fibrils which become aggregated into fibres upon dehydration during fixation and (3) interfibrillar fluid (cf. *PBA*, Vol. XXI, Abst. 2343). He also discusses differences between plant and animal cells in the relationship between caryocinesis and cytocinesis.

871 Chouinard, A. L.
Nuclear differences in *Allium cepa* root tissues as revealed through induction of mitosis with indoleacetic acid.
Canad. J. Bot. 1955 : **33** : 628–46.
Evidence has been obtained that indoleacetic acid does not act as a polyploidizing agent, but, by its stimulation of mitosis, reveals already existing differences in chromosome number in differentiated tissues.

872 Molè-Bajer, J.
A simple method for examining the action of chemicals on mitosis in living endosperm.
Acta Soc. Bot. Polon. 1955 : **24** : 619–25.
Descriptions are given of two methods of preparing smears of living endosperm tissue in which the influence of chemical substances on mitosis may be observed *in vivo*: (1) the embryo sac and its contents may be mounted and squashed in glucose-containing agar to which the substance to be investigated has been added; (2) the agent may be added, after smearing, to the embryo-sac liquid bathing the endosperm.

873 Battaglia, E. & Boyes, J. W.
Post-reductional meiosis: its mechanism and causes.
Caryologia 1955 : **8** : 87–134.
The authors give a comprehensive examination of the literature on postreductional meiosis in animals and in the Cyperaceae and *Luzula*, emphasizing that the relationship between such meiosis and the diffuse type of centromere requires much further investigation.

874 Battaglia, E.
The concepts of spore, sporogenesis and apospory.
Phytomorphology 1955 : **5** : 173–77.
In a further paper on terminology (cf. Abst. 867) the writer discusses the above in the light of some recent advances in the study of embryology and meiosis in the angiosperms.

875 Maeda, T.
(Chromosome association and separation. I. Results of observations on some higher plants in which genetical crossing-over has been studied).
Senshokutai (Chromosome)/Kromosomo 1954 : No. 20 : 715–23. [Japanese].
Data on chiasma frequency and degree of terminalization are presented for *Antirrhinum majus, Datura stramonium, Lathyrus odoratus, Pharbitis nil, Phaseolus caricanthus, Pisum sativum, Oryza sativa, Vicia faba* and *Zea mays*.

876 Katayama, T.
(Heritable asynapsis in plants).
Senshokutai (Chromosome)/Kromosomo 1955 : No. 22–24 : 836–42. [Japanese].
The literature on the following topics is reviewed: the nature of asynapsis, its genetic determination, the cytological mechanism, the behaviour of univalents, and pollen fertility and chiasmata in asynaptic plants.

877 Kirby-Smith, J. S. & Craig, D. L.
Some aspects of ultraviolet-induced chromosome aberrations in *Tradescantia* pollen.
Genetics 1955 : **40** : p. 579. (Abst.).
Ultraviolet irradiation of dry pollen resulted in "chromatid, isochromatid and chromatid/chromatid interchanges" in the relative frequencies 1 : 0·5 : 0·05. A spectrum for the induction of aberrations showed substantial agreement with the well-known curves for bacterial action and ultraviolet absorption by nucleic acid. Aberrations were independent of intensity of radiation over a tenfold variation in dose rate. Exposures in air and N resulted in equal frequencies of aberrations of the chromatid and isochromatid types, although a significantly higher number of incompletely fused isochromatid breaks were obtained with irradiation in N. This result may be explained according to the hypothesis that with treatment in N further primary breaks are produced and breaks are less likely to rejoin. No evidence of photorecovery of breakage was secured.

878 Deschner, E. & Sparrow, A. H.
Chromosome rejoining capacity with respect to breakage sensitivity to X-rays and thermal neutrons.
Genetics 1955 : **40** : 460–75.
Various stages of microsporogenesis in *Trillium erectum* were exposed to 50 r. of X rays or 10 minutes of thermal neutrons at 4–7 x 10^8 thermal neutrons/cm^2/sec. and observations were made on the subsequent amounts of

chromosome fragmentation and rejoining, the latter determined from the numbers of dicentric and ring chromosomes visible at anaphases I and II. Metaphase I was highly sensitive to fragmentation by both types of radiation and interphase showed low sensitivity. No consistent relationship was observed between the frequencies of fragmentation and rejoining, suggesting that these two effects of irradiation are governed by separate mechanisms. The stage of division most sensitive to X irradiation showed 50 times more fragmentation and 8 times more rejoining than the least sensitive; for thermal neutrons a fourfold difference was found in each case. The ratio fragmentation/rejoining showed a similar trend during the course of division for both thermal neutrons and X rays, indicating that the same or closely associated mechanisms were damaged by both treatments.

879 Sparrow, A. H., Moses, M. J. & Steele, R.
Sensitivity of chromosomes to breakage by X-rays and its relationship to the nucleic acid cycle in dividing cells.
US Atom. Energy Comm. 1953 : AECU–790 : p. 242. (Abst.).

Degree of sensitivity in *Trillium erectum*, as determined by the number of chromosome fragments produced after irradiation with 50 r. of 160 kv. X rays, underwent at least a 50-fold change during meiosis. It was highest at late prophase and metaphase I and lowest at early postmeiotic interphase. Microchemical analysis revealed no significant changes in the amount of either PNA or DNA per pollen mother cell during meiosis.

880 Bilquez, A.
Action des rayons X sur *Crepis zacintha* L. Babc.: Influence de différents facteurs sur le taux de léthalité cellulaire produit par les rayons X. (**Action of X rays on *C. zacintha* L. Babc. The influence of different factors on the rate of cell mortality caused by X rays**).
CR Acad. Sci., Paris 1955 : **241** : 900–02.

Dormant seeds with moisture contents of 5 and 15% and pregerminated seeds with a moisture content of 25% were X irradiated at 12, 21 and 28° C. to obtain information on the influence of moisture content and temperature on the rate of chromosome breakages and translocations. Cytological studies of the root-tip cells of plants grown from these seeds showed that sensitivity to X irradiation was directly related to the moisture content of the seeds. In the case of seeds with a low moisture content, temperature exercised a considerable effect on the frequency of chromosome breakages and translocations. Seeds irradiated at 13° C. showed the highest percentage of chromosome irregularities and seeds irradiated at 28° C the lowest. Temperature at time of irradiation had little influence on the number of chromosome irregularities in pregerminated seed with a high moisture content.

881 Cummings, J. M., Goldstein, L. & Blakeslee, A. F.
Chromosomal aberrations in *Datura* due to various kinds of irradiation.
Proc. nat. Acad. Sci. USA 1955 : **41** 355–58.

"X-rays, thermal neutrons, and fast neutrons from a nuclear detonation and from a cyclotron cause qualitatively similar chromosomal aberrations in *Datura*. Thermal neutrons are very damaging to *Datura* and may cause a higher frequency of rings of four plus rings of six than is caused by other radiations. Cyclotron neutrons were not as effective in causing chromosomal aberrations as were neutrons from a nuclear detonation. The reason for this is unknown". [Authors' summary]

882 Beatty, A. V.
The effects of low intensity X-radiation on the production of chromosomal aberrations in *Tradescantia* microspores.
Genetics 1955 : **40** : p. 564. (Abst.).

The frequency of chromosomal aberrations observable during the first microspore division in *Tradescantia paludosa* was used as a measure of the effects of low intensity X radiation in atmospheres of helium and pure oxygen. A total dose of 400 r. was used with deliveries at intensities of 1 r., 2 r., 3 r., 5 r., 15 r. and 25 r. per minute. The aberration frequency in helium was highest at 1 r., 68·5%, and lowest at 25 r., 24·5%. In oxygen the lowest frequency, 31·1%, was with 1 r. per minute while the highest, 76·8%, was at 25 r. At 2 r. per minute the aberration frequency was about the same in both helium and oxygen.

883 Conger, A. D.
How oxygen causes an increase in chromosomal aberration yield.
Genetics 1955 : **40** : p. 568. (Abst.).

In experiments on *Tradescantia* it was found that (1) the frequency of primary breakage increased as the result of X irradiation in oxygen, chromatid and isochromatid breaks undergoing

similar increases, (2) fusion of isochromatid breaks occurred at the same rate with or without oxygen, and (3) the frequency of fusion of chromatid breaks was approximately twice as great with irradiation in oxygen as in its absence. Oxygen therefore caused a rise in the yield of aberrations by increasing the frequency of primary breakage.

884 Anderson, L. F.
Effects of centrifugation on X-ray-induced chromatid aberrations in *Tradescantia* irradiated in air and N_2.
Genetics 1955 : **40** : p. 563. (Abst.).
Immediate centrifuging after irradiation of the inflorescences with 100 r. for 1 min. resulted in a considerable increase in total breakage and ratio of intrachromosomal : interchromosomal exchanges. With similar treatment after irradiation with 200 r. for 1 min. in N, smaller differences were obtained between centrifuged and noncentrifuged material, only isochromatid breaks showing a definite increase in frequency. Experiments with intervals between irradiation and centrifuging suggested that restitution in N began immediately after breakage.

885 Kihlman, B. A.
Oxygen and the production of chromosome aberrations by chemicals and X-rays.
Hereditas, Lund 1955 : **41** : 384–404.
In experiments on root tips of *Vicia faba*, the radiomimetic effect of nitrogen mustard was not dependent on the oxygen concentration during treatment. Oxygen concentration influenced the induction of aberrations by 8-ethoxycaffeine (EOC) and X rays in a similar way, except that in the absence of oxygen, EOC, unlike X irradiation, had practically no effect (cf. *PBA*, XXV, 690). Sodium azide and 2,4-dinitrophenol suppressed the radiomimetic effect of EOC. It is suggested that adenosine triphosphate or a related compound is involved in the production of aberrations by EOC, the formation of energy-rich phosphate bonds being greatly reduced in the absence of oxygen.

886 Oyama, T.
(Meiotic peculiarities following irradiation with high doses of X rays).
Senshokutai (Chromosome)/Kromosomo 1954 : No. 21 : 752–59. [Japanese].
Observations at 30-minute intervals were made on *Allium cepa* root tips after exposure to 500 r. of X rays. The frequency of aberrant cell division increased with time. Associated abnormalities included chromosome condensation and disappearance of the nucleolus.

887 Riley, H. P.
The protective effect of various chemical compounds against damage to chromosomes by gamma radiation.
Amer. J. Bot. 1955 : **42** : 765–69.
Treatment of onion root tips with sodium hydrosulphite and 2,3-dimercaptopropanol (BAL) in concentrations of 2×10^{-3} and 2×10^{-4} M before, during and after γ irradiation resulted in reduced frequencies of interchanges and deletions. Protection against the formation of anaphase bridges was provided by 4×10^{-2} and 4×10^{-3}M BAL, 4×10^{-3} and 4×10^{-1}M sodium hyposulphite and 4×10^{-2} to 4×10^{-1}M sodium pyrosulphate, $2{\cdot}8 \times 10^{-1}$M glucose, 4×10^{-4} and 4×10^{-5}M BAL, 4×10^{-5} and 4×10^{-6}M sodium hydrosulphite and 4×10^{-2} to 4×10^{-6}M sodium persulphate. Treatment with 1·7 M ethanol resulted in a slight reduction in the frequency of anaphase bridges.

888 Battaglia, E.
A consideration of a new type of meiosis (mis-meiosis) in Juncaceae (*Luzula*) and Hemiptera.
Bull. Torrey bot. Cl. 1955 : **82** : 383–96.
Examining recent literature describing the type of meiosis, here termed mis-meiosis, characterized by the apparent transverse breakage of the chromosomes at anaphases I and II and reported in species regarded as having polycentric or dicentric isochromosomes, the author gives reasons for concluding that such a process has not yet been satisfactorily demonstrated in any organism.

889 Gori, C. & Maugini, E.
Effetti citologici e rizogeni di alcune sostanze di crescita. **(Cytological and rhizogenous effects of certain growth substances).**
Caryologia 1955 : **7** : 404–14.
Experiments with 2,4-D and six related compounds showed them all to act as root poisons and most of them produced c-tumours; all stimulated root formation but mitotic stimulation was observed only with 2,4-D.
The production of c-tumours seems to depend on the presence of substituted Cl in the ring of phenoxyacetic acid; in certain positions this induces c-mitosis too whereas in others it does not.

890 MELETTI, P.
Azione mitostatica dell'acido salicilico sui tessuti della radice di *Allium cepa* L., stimolati alla mitosi. Studio cito-istologico sperimentale. (**Mitostatic action of salicylic acid on root tissues of *A. cepa* L. stimulated to mitosis. An experimental cyto-histological study**).
Caryologia 1955 : **8** : 33–44.

Treatment with 2,4-D first stimulated mitotic activity but if applied for prolonged periods depressed it; salicylic acid was found to have a mitostatic effect from the start. In roots which had been stimulated to mitotic activity by 2,4-D this activity was quickly inhibited by passage to salicylic acid; the formation of c-tumours, however, continued unaffected.

891 STURTEVANT, F. M.
Stathmokinetic effect of a kojic acid derivative in the *Allium* test.
Genetics 1955 : **40** : p. 600. (Abst.)

Among the kojic-acid derivatives tested, SC–5148 [2-(5′-hydroxy-4-oxo-2′-γ-pyranylmethyl)2-thio-3-methylpseudourea HCl] was the most active.

892 SESHACHAR, B. R. & MAMBIAR, P. K.
Effects of carbon tetrachloride on mitosis.
Nature, Lond. 1955 : **176** : p. 796.

Treatment of root tips of *Allium cepa*, *A. sativum* and *Zephyranthes* sp. with carbon tetrachloride caused various abnormalities, such as dissolution of the nuclear membrane and outflow of its contents at interphase, despiralization of the chromosomes at metaphase and side loops, formation of sticky bridges at anaphase and polyploid nuclei.

893 SMITH, H. H. & LOTFY, T. A.
Effects of beta-propiolactone and ceepryn on chromosomes of *Vicia* and *Allium*.
Amer. J. Bot. 1955 : **42** : 750–58.

A detailed report is given of investigations which have been already referred to in *PBA*, Vol. XXV, Abst. 2703.

894 STEFFENSEN, D.
Interaction effects of metal ions in the production of spontaneous chromosomal aberrations in calcium-deficient *Tradescantia*.
Genetics 1955 : **40** : p. 598. (Abst.)

Growth in water with a Ca deficiency resulted in a frequency of aberrations in the pollen at least 17 times that in plants receiving an optimum supply of Ca. The interaction of high and low concentrations of Mg, Mn or K with different concentrations of Ca in the production of aberrations is described. It is postulated that the chromosome may be partly regarded as a giant chelate polymer, on which DNA molecules of the same type at a given "locus" would be coordinated in precise juxtaposition by cations; cross-linking by cations would occur between two phosphate groups of different molecules at each revolution of the double helix.

895 SAMPFORD, M. R.
The truncated negative binomial distribution.
Biometrika 1955 : **42** : 58–69.

This article is the full version of that summarized in *PBA*, Vol. XXV, Abst. 63.

896 HAGBERG, A.
Översikt över polyploidiförädlingen i Sverige. (**Survey of the breeding of polyploids in Sweden**).
Sverig. Utsädesfören. Tidskr. 1955 : **65** : 209–14.

The importance of induced polyploidy in crop plants as a means of increasing the range of material at the disposal of the plant breeder is stressed, the technique of doubling the chromosome complement by colchicine treatment is outlined and problems such as reduction in fertility in artificially induced polyploids are described. In mentioning successes achieved in Sweden in breeding polyploid forms of clover, dill, turnip, rye and apple, special consideration is given to the development of the Sirius tetraploid turnip, which is held to be an outstanding example of what may be achieved in this field. In conclusion, the author discusses the value of induced polyploidy as a means of obtaining fertile hybrids in distant crosses.

897 CASTIGLIA, E.
Sulla poliploidia istologica nei vegetali: osservazioni in *Scilla obtusifolia* Poir. (**On histological polyploidy in plants: observations in *S. obtusifolia* Poir.**).
Caryologia 1955 : **7** : 420–37.

After treatment with 2,4-D to promote growth, plants of *Papaver orientale* ($2n = 42$) revealed the presence in both shoots and roots of cells with $2n = 84$ and a certain number with higher degrees of polyploidy, probably $8n$. In *P. rhoeas* ($2n = 14$) tetraploid cells were also observed but not in *P. somniferum* ($2n = 22$). In *S. obtusifolia* ($2n = 8$), tetraploid and occasional octoploid nuclei were observed and in this species it was possible to make a more detailed study of the origin of the polyploid cells. Similar phenomena of polyploidy were

observed, though less frequently, in plants not treated with 2,4-D.

898 Schnack, B. & Fehleisen, S.
Observaciones en poliploides del género *"Glandularia"* (*Verbenaceae*). [Observations on polyploids of the genus *Glandularia* (*Verbenaceae*)].
Rev. Fac. Agron. Eva Perón 1955 : **31** : 39–52.

A method for calculating the affinity between species from the number of multivalents formed in autotetraploids and in tetraploids from hybrids between species is proposed. If the percentage in the former is M and in the latter m then the affinity index $= \frac{m}{M}$. The artificial polyploids were found to have a much larger proportion of pollen grains with four pores than naturally occurring polyploid species.

899 Studitskiĭ, A. N.
(In defence of the new direction in research on cell theory).
Uspehi Sovrem. Biol. (Advanc. in Mod. Biol.) 1955 : **40** : 94–107. [Russian].

The author's own findings in experiments on regeneration of animal tissues conflict with Virchow's principle that all cells arise by simple division and support Lepešinskaja's theory that cells arise *de novo* from noncellular living substance. The arguments against the new cell theory (cf. *PBA*, Vol. XXV, Abst. 2661) are rejected.

900 Haldane, J. B. S.
Some alternatives to sex.
New Biol. 1955 : No. 19 : 7–26.

A brief survey is presented of types of recombination and inheritance other than those occurring in normal sexual reproduction. The topics discussed include transformation, transduction and recombination in bacteria, mitotic crossing over in *Aspergillus* and *Drosophila* and graft hybrids in apples.

901 Lane, G. R. & Paton, J.
Bacterial maceration for Feulgen squash preparations of plant tissues.
Stain Tech. 1955 : **30** : 189–92.

An active pectinolytic extract obtained from *Bacterium aroideae* is an effective macerating medium for materials insufficiently macerated by hydrolysis in N HCl. A technique involving use of such an extract has proved valuable for examining the effects of radiation and chemical agents on the chromosomes of roots of *Tradescantia paludosa.*

902 Hornsey, S.
Preparation of cell suspensions from plant roots for cytological studies.
Nature, Lond. 1955 : **176** : 744–45.

Suspensions with a negligible proportion of broken cells may be prepared as follows. Root tips are fixed overnight in a mixture of acetic acid and ethanol, washed for 1 hr. and hydrolysed in N HCl at 60–63° C for 10 min. After Feulgen staining, the tips are transferred to 45% acetic acid and disintegrated by being drawn into and out of a syringe through a serum needle for 3 min. X-ray-induced abnormalities in *Vicia faba* have been investigaged by this technique.

903 Romberg, P. F.
A method for procuring large numbers of soil-free root tips.
Bot. Gaz. 1955 : **116** : p. 291.

An apparatus is described in which material can be grown so as to provide a continuous and abundant supply of soil-free root tips for cytological study.

904 Lewis, D.
Sexual incompatibility.
Sci. progr. 1955 : **43** : 593–605.

With the nongeneticist in mind the author gives a general account of the genetical and evolutionary aspects of incompatibility in the higher and lower plants.

905 Ahmad, M.
Self-incompatibility in angiosperms and the immunity reactions.
Pakist. J. sci. Res. 1955 : **7** : 81–83.

Examining some of the literature, the author reaches the conclusion already summarized in Abst. 165.

906 Visser, T.
Germination and storage of pollen.
Meded. LandbHogesch., Wageningen 1955 : **55** : No. 1 : 1–68.

The practical importance of maintaining pollen fertility over long periods to enable crosses to be effected between plants in different parts of the world or between plants flowering at different times is stressed and, in this context, the literature is discussed in relation to the author's own experiments on the germination and storage of pollen. Among the subjects dealt with are the choice of media for germination experiments *in vitro*, the function of osmotic pressure in germination, the influence of temperature, the roles played by boron and sugar, the mutual stimulation of pollen grains, the chemical nature of the stimulating substance

exuded by the pollen grain and whether experiments *in vitro* provide a reliable indication of what occurs *in vivo*. It was shown that germination rate and growth of the pollen tube were positively correlated with the rate of water diffusion into the pollen; that the degree of boron sensitivity of the pollen was correlated with the boron level of the plant and with the osmotic properties of the germination medium used; that varietal differences existed in some fruits as to the most suitable medium; and that, in most plant species, pollen longevity increases with decreasing relative humidity. The necessity of a continuous supply of boron during the germination process indicated that this substance is used up in the course of pollen-tube growth.

DISEASES, INJURIES, BACTERIA, FUNGI, VIRUSES

907 Cercós, A. P.
Streptomyces rutgersensis var. *castelarense* n. var. Nuevas propiedades de la canfomicina. (***S. rutgersensis* var. *castelarense* n. var. New properties of camphomycin**).
Rev. Invest. agríc. B. Aires 1954 : **8** : 263–83.

The organism which produces camphomycin has been identified as a form of *S. rutgersensis* and has been named var. *castelarense*. Its properties are described.

908 Skaar, P. D. & Garen, A.
Transfer of DNA accompanying genetic recombination in *E. coli* K-12.
Genetics 1955 : **40** : p. 596. (Abst.)

"The cell to cell passage of DNA was assayed by mixing bacteriophage resistant cells labelled with P^{32} with unlabelled phage sensitive cells, lysing the sensitive cells, and measuring the radioactivity in the DNA of liberated phage. DNA transfer was found to be predominantly unilateral, from Hfr to F–, and directly correlated with genetic transfer as inferred from recombination analyses."

909 Holloway, B. W.
Genetic recombination in *Pseudomonas aeruginosa*.
J. gen. Microbiol. 1955 : **13** : 572–81.

Evidence of recombination in *Ps. aeruginosa* has been obtained from crosses involving 18 biochemical mutants of 4 strains, but the mechanism of this recombination has not yet been elucidated and no conclusions could be drawn concerning linkage and gene order. The four strains were interfertile in certain combinations but, unlike *Escherichia coli*, were self sterile. No F system similar to that affecting fertility in *E. coli* was detected. Differences in crossing ability were however found among recombinants.

910 Ravin, A. W.
Factors affecting the nonindependent recovery of capsular and streptomycin-resistant transformants in *Pneumococcus*.
Genetics 1955 : **40** : p. 591. (Abst.)

DNA extracts of streptomycin-resistant, fully encapsulated pneumococci are capable of dissociable transforming activity with respect to these two attributes. Incorporation of the agent for the synthesis of capsular polysaccharide requires a restricted dispersion of the cells in the medium; use of agglutinating antisera is one means of obtaining this condition. Incorporation of the agent for streptomycin resistance does not exhibit the same dependence on agglutination. If agents for the two properties are obtained from different cells and combined before treatment of the host, recovery of double transformants in the presence or absence of agglutinins is not significantly greater than that expected were the two agents acting independently. A significant excess over the expected recovery was however obtained when the cells were treated with the two agents in an extract derived from a single strain and not subsequently agglutinated.

911 Stocker, B. A. D.
Abortive transduction of motility.
Heredity 1955 : **9** : 290–91. (Abst.).

Results have been obtained which are consistent with the following hypothesis. When motility is transduced from motile, wild-type *Salmonella* to nonmotile strains, the factor for flagellation may sometimes displace its "allele" for nonmotility in the recipient cell, which will consequently only produce motile offspring; at other times the flagellation factor may simply persist as a nonreplicating supernumerary gene which is transmitted to one of the daughter cells and which, if dominant over its "allele", confers motility on the cell bearing it. The daughter cell which does not obtain the supernumerary gene may receive a few nonmultiplying but persisting particles (possibly flagella or their basal granules) which become distributed among the descendants; a cell containing one such particle is only weakly motile.

912 LEDERBERG, J. & STOCKER, B.
"Phenotypic" transductions of motility in Salmonella.
Genetics 1955 : **40** : p. 581. (Abst.)
Only 5% of the motile cells obtained by transduction gave rise to subclones stable for motility. The remainder formed predominantly nonmotile clones, the small number of motile individuals produced usually transmitting motility to only one daughter at each successive fission as if carrying a nonreplicating determinant of motility. Such determinants may be damaged or misplaced genes or persistent gene products.

913 LENNOX, E. S.
Transduction of linked genetic characters of the host by bacteriophage P1.
Virology 1955 : **1** : 190–206.
In *Escherichia coli* 'K12', marker characters showing close linkage in sexual crosses were transduced jointly by means of the temperate phage P1, the frequency of joint transduction decreasing sharply with increased frequency of recombination. The characters of λ prophage were also transduced by phage P1. Transduction of several characters between *E. coli* and *Shigella dysenteriae* was indicative of genetic homologies between these two species.

914 JACOB, F.
Transduction of lysogeny in *Escherichia coli.*
Virology 1955 : **1** : 207–20.
The temperate phage 363, probably belonging to the same group as phage P1, behaved as a transducing agent in *E. coli* 'K12', linked characters being transferred simultaneously. Lysogeny or nonlysogeny, with respect to each of the three prophages 82, λ and 434, was transduced together with the marker *Gal*$^+$, to which these prophages are linked, as shown by recombination data. Recombination between two genetically different and complementary prophages occurred in transduction.

915 MORSE, M. L.
Cis-trans position effect in transduction heterogenotes of *Escherichia coli.*
Genetics 1955 : **40** : 586–87. (Abst.)
The phage λ is able to transduce a chromosome fragment which includes *Gal* genes for galactose fermentation, most of the transduced clones being "diploid" or heterogenotic for the transferred genes. Heterogenotes of the cis type ++/−− were galactose fermenters but those of the trans type +−/−+ were galactose negative. In negative clones, positive heterogenotes were later formed by crossing-over in occasional cells. Further segregation resulted in all possible haploid combinations of + and − genes. Reciprocal transductions gave identical phenotypes; the genes in the fragment are therefore functionally equivalent to the homologous genes in the complete chromosome.

916 LEDERBERG, E. M.
Pleiotropy for maltose fermentation and phage resistance in *Escherichia coli* K-12.
Genetics 1955 : **40** : 580–81. (Abst.)
Maltose fermentation and resistance to virulent λ mutants, previously reported to be controlled by the loci Mal_1 and Lp_2 respectively, have been found to be the pleiotropic manifestations of a single locus. Several other loci have been discovered with pleiotropic effects upon maltose utilization and reaction to phage. The dual effects may or may not be correlated, according to the locus in question.

917 FOX, M. S. & SZILARD, L.
A device for growing bacterial populations under steady state conditions.
J. gen. Physiol. 1955 : **39** : 261–66.

FOX, M. S.
Mutation rates of bacteria in steady state populations.
Ibid. 1955 : **39** : 267–78.
The photocell-controlled device described in the first paper and also the chemostat have been used to measure rates of mutation in *Escherichia coli* from sensitivity to phages T_5 and T_6 to resistance on different media at constant density of population. The rates were higher on complex media than on a minimal medium. In addition, the rates on complex media decreased with increasing generation time (time required for an *e*-fold increase in number) and were not significantly affected by mutagens and antimutagens of the purine type. Disparity in chemical environment is regarded as being a more probable cause of the dissimilarity in mutation rate than a wide difference in division lag.

918 LEIFSON, E. & PALEN, M. I.
Variations and spontaneous mutations in the genus *Listeria* in respect to flagellation and motility.
J. Bact. 1955 : **70** : 233–40.
A technique for detecting and isolating flagellation and motility mutants in *Listeria* is described. Preliminary data suggest that mutations

of this type occur at the rate of 10^{-8} to 10^{-9} per cell division. Four types of nonmotile variants were isolated.

919 Demerec, M., Blomstrand, I. & Demerec, Z. E.
Evidence of complex loci in *Salmonella*.
Proc. nat. Acad. Sci. USA 1955 : **41** : 359–64.

"By use of transduction tests, phenotypically similar auxotrophic mutants of *Salmonella* can be separated into well-defined groups, and this grouping corresponds with the grouping arrived at by studies of their biochemical blocks. It is assumed that each such group represents a gene locus and that different members of a group are 'nonidentical alleles (pseudoalleles),' which have originated through mutations occurring at different sites in a gene locus". (Cf. Abst. 243).
[Authors' summary]

920 Ryan, F. J.
Spontaneous mutation in non-dividing bacteria.
Genetics 1955 : **40** : 726–38.

Mutations from the histidineless (h^-) to the nonhistidine-requiring condition (h^+) occurred at the rate of *ca.* 10^{-9} per bacterium per hour in nondividing cultures of *Escherichia coli*. This rate is one fortieth of that in growing bacteria. Possible causes of mutation in the stationary phase are discussed.

921 Sneath, P. H. A.
Spontaneous nature of a heritable change to production of penicillinase.
Heredity 1955 : **9** : p. 290. (Abst.).

A spontaneous heritable change from penicillin sensitivity, due to inability to produce penicillinase, to penicillin resistance due to the production of the enzyme, has been observed in *Bacillus cereus*. It has been shown that the change is not caused by penicillin treatment. (Cf. Abst. 923).

922 Rubin, B. A.
The relation of nucleic acid metabolism to the genetic effect of radiation in bacteria.
US Atom. Energy Comm. 1953 : AECU–1436 : 241–42. (Abst.).

"An examination of the mutant population (resistant to streptomycin) in cultures [*Escherichia coli* B/r] which have grown from 0 (resting) to 14 generations during irradiation indicates that the mutation rate is affected by the radiation dose, but not by the number of genetic reduplications during irradiation. Under the same conditions, changes in nucleic acid metabolism appear which are related to the extent of synthesis that has occurred during the irradiation."

923 Sneath, P. H. A.
Proof of the spontaneity of a mutation to penicillinase production in *Bacillus cereus*.
J. gen. Microbiol. 1955 : **13** : 561–68.

By means of the 'velvet pad replicate technique' mutation from penicillin sensitivity to resistance due to the production of large amounts of penicillinase was found to be a spontaneous event occurring in the absence of penicillin. The rate of mutation was approximately 3×10^{-8} per bacterium per division.

924 Kaplan, R. W.
Influence of the water content on the UV-sensitivity of DNA and its bearing on biological UV-effects.
Naturwissenschaften 1955 : **42** : 466–67.

Experiments at the Department of Zoology, Columbia University, NY, showed that the rate of mutation and lethality of bacteria exposed to ultraviolet rays was increased when the moisture content of the bacteria had been reduced prior to irradiation. It was further demonstrated that dehydration of deoxyribose nucleic acid resulted in an increase in the rate of gel formation when the DNA was irradiated. The similarity observed between the effect of drying on the rate of mutation of bacterial cells on the one hand and the rate of gel formation in DNA on the other, when both are treated with ultraviolet rays, is interpreted as suggesting that mutation may arise as the result of the breakage of hydrogen bonds, and consequent tautomeric rearrangements in the bases.

925 Helmke, R.
Über die Sensibilisierung von *Bact. coli* B gegen die Bestrahlung mit kurzwelligem Ultraviolett der Wellenlänge 2537 Å durch Eosin. (**On the sensitivization of *B. coli* B to irradiation with short-wave ultraviolet rays of the wave length 2537 Å by eosin**).
Naturwissenschaften 1955 : **42** : p. 515.

Twice as many mutants were obtained when eosin was added to the culture medium prior to irradiation as when the cells were irradiated in the absence of eosin. The mutants were characterized by inhibition of the capacity to form colonies.

926 Stapleton, G. E.
Variations in the sensitivity of *Escherichia coli* to ionizing radiations during the growth cycle.
J. Bact. 1955 : **70** : 357–62.
In experiments on *E. coli* it was found that the lag phase was characterized by increased resistance to the mutagenic effect of irradiation and that the phase of logarithmic growth coincided with a steady decline in resistance.

927 Clowes, R. C. & Rowley, D.
Genetic studies on small-colony variants of *Escherichia coli* K-12.
J. gen. Microbiol. 1955 : **13** : 461–73.
Stable small-colony variants of *E. coli* 'K12' and several of its auxotrophs were isolated from cultures treated with $CuSO_4$. Data from crosses of the variants with strains normal in colony size suggested that the character of small colony was controlled by mutation at one of several possible loci, the different variants being non-allelic. When one variant was used as F^- parent, a lower recombination rate and higher percentage transfer of F^+ markers were obtained, compared with the mating of normal F^+ and F^- parents, but when used as F^+ parent the recombination rate and transfer of markers were normal; the possible cause of this behaviour is discussed.

928 Lark, K. G., Maaløe, O. & Rostock, O.
Cytological studies of nuclear division in *Salmonella typhimurium*.
J. gen. Microbiol. 1955 : **13** : 318–26.
Using the technique of inducing synchronous nuclear division by temperature shift, a crude series of successive cytological stages, viz. "dot", "wedge", "bar" and "dumbbell", was distinguished. No mitotic configurations could be recognized.

929 DeLamater, E. D., Minsavage, E. J. & Tosteson, C. G.
Synchronization of nuclear and cytoplasmic division in *Bacillus megaterium*.
Genetics 1955: **40** : p. 569. (Abst.)
Nuclear and cellular division were synchronized by means of cold shock. The different stages of mitosis were statistically analysed, the time required for each stage being determined.

930 DeLamater, E. D., Scott, D. McN. & Minsavage, E. J.
Correlation of nuclear and metabolic events during bacterial division.
Genetics 1955 : **40** : p. 569. (Abst.)
It is stated that the time sequence of cytologically observable nuclear events and cytoplasmic division have been correlated with chemically determined increases in nucleic acids and acid-soluble components.

931 Dean, A. C. R. & Hinshelwood, C.
The rate of development of colonies of *Bacterium lactis aerogenes* on agar plates containing drugs.
Proc. roy. Soc. 1955 : ser. B : **144** : 297–314.
The results of comparisons of the rate of development of colonies by trained and untrained bacteria plated on media containing various drugs were in some cases clearly incompatible with the view that cells producing colonies were preexistent, adapted mutants. Time-number relationships in other cases were not obviously inconsistent with the preexistence of at least some adapted cells. These cases could however be equally well explained by assuming that "competition" occurred between adaptation and death of the cells and that there was a scatter in the physiological factors disposing the cells to grow.

932 Okabe, N.
(Studies on *Pseud. solanacearum*. V. Antagonism between strains).
Shizuoka Diagaku Nogakubu Kenkyu Hokoku/Rep. Fac. Agric. Shizuoka Univ. 1954 : No. 4 : 37–40. [Japanese].
Five strains of *Pseudomonas solanacearum* were found to produce a diffusible antibiotic substance that inhibits the growth of some strains of the species though not of some others.

933 Cavalli-Sforza, L. L., Petrella, L. & Gerra, A.
Cytologically active substances produced by soil micro-organisms.
Heredity 1955 : **9** : 249–54.
Onion root tips were treated with culture filtrates from a number of microorganisms isolated from soil samples. Antimitotic activity producing effects resembling those obtained by the action of colchicine was found in filtrates from organisms of the following groups: Eubacteriales, Actinomycetales, Moniliales, Ascomycetes and two unidentified fungi. In a few cases mutagenic action resulting in chromosome fragmentation or chromatin bridges was found. No definite correlation could be shown between antimitotic and antibiotic activity. It is suggested that antimitotic agents from soil microorganisms are likely to be the cause of apparently spontaneous polyploidization in nature.

934 HERRMANN, E. C. (JUN.)
Studies on the mechanism of the loss of chloramphenicol resistance in *Escherichia coli.*
Abstr. Diss. Univ. Md. 1955 : **8** : No. 2 : p. 13. (Abst.)
Chloramphenicol-sensitive cells were produced in media with or without this antibiotic. Such mutants were responsible for the loss of resistance in chloramphenicol-free media since they overgrow the resistant cells. Five mutant types differing in degree of sensitivity were detected.

935 EISENSTARK, A. & BERNSTEIN, L. B.
Specificity of bacteriophages of *Xanthomonas pruni.*
Phytopathology 1955 : **45** : 596–98.
Of 212 strains of *Xanthomonas*, comprising about 50 species, only 13 strains, all of *X. pruni*, were lysed by a mixture of six phage types isolated from *X. pruni*. Three strains of *X. pruni* proved to be lysogenic. When tested with individual phage types, the 13 susceptible strains varied in the amount of lysis shown.

936 OKABE, N.
(Studies on *Pseud. solanacearum.* IV. On lysogenic strains).
Shizuoka Kaigaku Nogakubu Kenkyu Hokoku/Rep. Fac. Agric. Shizuoka Univ. 1954 : No. 4 : 28–36. [Japanese].
Eight lysogenic strains of *Pseudomonas solanacearum* were identified; it appears that at least five types of prophage occur.

937 UTAGAWA, K. & KANIE, M.
(Studies on mutation in fermentation fungi. On the isolation of mutants induced by ultraviolet irradiation and their characteristics).
Kagoshima Daigaku Nogakubu Gakujutsu Hokoku/Bull. Fac. Agric. Kagoshima Univ. 1954 : No. 3 : 100–13. [Japanese].
Descriptions are given of a series of morphological and biochemical mutants of *Aspergillus kawachii* induced by treatment with ultraviolet radiation.

938 SHARPE, H. S.
Analysis of heterokaryosis in a wild homothallic ascomycete.
Heredity 1955 : **9** : p. 289. (Abst.).
Of the two heterocaryotic lines found among 15 isolates of wild *Aspergillus glaucus*, one proved to be a stable heterocaryon in which the two nuclear components differ in respect of a single gene or supergene, while the other was very unstable, with the constituent nuclei differing in many genes. Both growth rate and morphological characters appeared to be controlled by several polymeric genes or polygenic blocks.

939 TSUDA, S.
Studies on heterocaryosis in *Aspergillus* and *Penicillium.*
Indian Phytopath. 1955 : **8** : 1–8.
A case of heterocaryosis was observed in *A. candidus*. In addition, heterocaryons induced between two varieties of *A. awamori* and between two mutants of *P. chrysogenum* are described. The continuous variation in the colour and morphology of the colonies of the heterocaryotic strains of *P. chrysogenum* is attributed to the varying proportion of nuclei contributed by the two mutants.

940 LEBEN, C., BOONE, D. M. & KEITT, G. W.
***Venturia inaequalis* (Cke.) Wint. IX. Search for mutants resistant to fungicides.**
Phytopathology 1955 : **45** : 467–72.
Line 3164, a slow-growing mutant able to grow in the presence of high concentrations of antimycin A, was obtained by exposing conidia of the wild-type line 365–4 to ultraviolet radiation. The slow growth rate of 3164 and its resistance to antimycin A appear to have resulted from a single gene mutation. Unlike the wild-type parent, the mutant was not pathogenic in tests on McIntosh apple trees. No mutants resistant to sulphur, Thiram or Helixin B were obtained.

941 BROWN, F. L.
A naturally occurring albino mutant of *Endoconidiophora fagacearum.*
Proc. W. Va. Acad. Sci. 1954 : **26** : p. 102.
An albino mutant which, on being mated with a compatible dark strain, gave dark and albino forms in a 1 : 1 ratio has been found on an oak in West Virginia.

942 YANOFSKY, C. & BONNER, D. M.
Non-allelic suppressor genes affecting a single *td* allele.
Genetics 1955 : **40** : 602–03. (Abst.)
Four genes, su_{2a}, su_{2b}, su_{2c} and su_{2d}, suppressing the defect in tryptophane synthesis caused by td_2, were induced in *Neurospora crassa* by ultraviolet irradiation; none of these mutations was allelic to su_2, a suppressor discovered in previous investigations (cf. *PBA*, Vol. XXIV, Abst. 1669). With the possible exception of su_{2b} and su_{2c}, the new suppressors were at separate loci.

943 STADLER, D. R.
Double crossing over in *Neurospora.*
Science 1955 : **122** : 878–79. (Abst.).
In a study of cross overs affecting the segment between the centromere and a locus for spore mutation (region A) and a marked region in the opposite arm of the same chromosome (region B), analysis of 2928 asci revealed 43 two-strand,

54 three-strand and 53 four-strand double crossovers. These numbers are consistent with the 1 : 1 : 1 ratio expected with random association of the strands. Data on 198 asci with no crossing over in region A indicated a length of 16·7 map units for region B; among 610 asci with single cross overs in region A, the exchange rate in region B was 16·6 units. Crossing-over events in one arm therefore have no correlation with or influence upon such events in the other arm.

944 St. Lawrence, P.
Investigations of the Q locus in *Neurospora.*
Genetics 1955 : **40** : p. 599. (Abst.)

Investigations were carried out on four niacin-requiring mutants q – 1, q – 2, q – 3 and q – 4, which arose independently and accumulate quinolinic acid and do not form heterocaryons. The first three mutants undergo rare spontaneous reversion, the region *q* being situated in linkage group I, approximately one unit distal to that affecting lysine utilization. Reversions of q – 4 and evidence of linkage between the mutant involved and the locus for lysine synthesis were not obtained. Stocks of the mutants carrying various arrangements of markers were crossed and the ascospores plated on a niacin-free medium. The colonies obtained were tested by crossing with the wild type; 90% or more of the colonies contained nuclei carrying the property of niacin independence. Such colonies could not be attributed to an extra chromosome, suppressors or crossing-over. It is suggested that they may be due to a mutational process involving a restricted chromosomal region associated with *q*.

945 Doudney, C. O. & Wagner, R. P.
Genetically conditioned metabolic antagonism and suppressor action in *Neurospora.*
Proc. nat. Acad. Sci. USA 1955 : **41** : 364–69.

A detailed report is given of investigations already referred to in *PBA*, Vol. XXV, Abst. 2778.

946 Mitchell, M. B.
Aberrant recombination of pyridoxine mutants of *Neurospora.*
Proc. nat. Acad. Sci. USA 1955 : **41** : 215–20.

Wild-type offspring have been obtained from crosses between the two pyridoxine mutants *pdx* and *pdxp* though none were observed in *pdx* x *pdx* or *pdxp* x *pdxp* crosses. Since the segregation ratios of these genes and the markers *co* (colonial) and *pyr* 1 (pyrimidine) indicate that *pdx* and *pdxp* are allelic, it is suggested that the pyridoxine mutants may be complementarily defective for pyridoxine requirement and that, by double duplication of the part of one allele lacking in the other and its transfer to the latter during chromosome pairing, the restoration of the wild condition would occur.

947 Mitchell, M. B.
Further evidence of aberrant recombination in *Neurospora.*
Proc. nat. Acad. Sci. USA 1955 : **41** : 935–37.

Evidence, based on the unexpected frequency of apparent double-cross-overs involving the gene *pdx* (cf. Abst. 946) is presented for concluding that *pdx* may be transformed into the wild condition in + x *pdx* crosses. Similar behaviour by the nearby *arg* gene was not observed.

948 Strauss, B. S.
The nature of the lesion in the succinate-requiring mutants of *Neurospora crassa*: Interaction between carbohydrate and nitrogen metabolism.
Genetics 1955 : **40** : 599–600. (Abst.)

The dicarboxylic-acid deficiency in *suc* mutants is probably the result of disturbance in carbon-dioxide fixation (cf. *PBA*, Vol. XX, Abst. 2780).

949 Fincham, J. R. S. & Boylen, J. B.
A block in arginine synthesis in *Neurospora crassa* due to gene mutation.
Biochem. J. 1955 : **61** : xxiii–xxiv. (Abst.)

A single-gene mutant accumulated argininosuccinic acid in the presence of citrulline; it lacked the single enzyme required for the catalysis of the production of arginine and fumaric acid from argininosuccinic acid.

950 Suskind, S. R., Yanofsky, C. & Bonner, D. M.
An immunochemical study of allelic strains of *Neurospora* lacking tryptophan synthesis.
Genetics 1955 : **40** : p. 600. (Abst.)

Suskind, S. R., Yanofsky, C. & Bonner, D. M.
Allelic strains of *Neurospora* lacking tryptophan synthetase: a preliminary immunochemical characterization.
Proc. Nat. Acad. Sci. USA 1955 : **41** : 577–82.

With one exception, all the allelic tryptophane-requiring mutants studied contained proteins

which cross-reacted with tryptophane-synthetase antibodies. Mutants with specific suppressor genes formed both active enzyme and cross-reacting antigens.

951 Nysterakis, F.
Obtention de nombreuses souches de *Neurospora tetrasperma* par l'acide indol-β-acétique. (The induction of numerous strains of *N. tetrasperma* by indole-β-acetic acid).
CR Acad. Sci., Paris 1955 : **241** : 1331–33.

A wide range of variants, differing in morphology, pigmentation, rate of growth and ability to form arthrospores, were obtained by plating *N. tetrasperma* on a medium containing indole-β acetic acid.

952 Atwood, K. C. & Pittenger, T. H.
The relation between the X-ray survival curves of *Neurospora* microconidia and ascospores.
Genetics 1955: **40** : 563–64. (Abst.)

"The survival curve of uninucleate microconidia of *Neurospora crassa* with X rays (250 kvp with 3 mm of Al filtration) is complex, having both single and multiple target components. The survival curve of the ascospores, which are binucleate, was found to be related in a simple way to that of the uninucleate microconidia. The ascospore survival is given by $S_{asc.} = 1 - (1 - s)^2$ where s is the survival of microconidia. In other words, the ascospores behave as though each consisted of two independent microconidia taken together. The mutual independence of the nuclei in ascospores is in contrast to the nuclear interaction in multinucleate macroconidia in which the survival curve cannot be derived from that of microconidia."

953 Atwood, K. C. & Mukai, F.
Nuclear distribution in conidia of *Neurospora* heterokaryons.
Genetics 1955 : **40** : 438–43.

The distribution of genetically marked nuclei in the macroconidia formed by *Neurospora* heterocaryons was frequently nonrandom (cf. *PBA*, Vol. XXIV, Abst. 874), similar nuclei tending to occur together in the same cell. A formula is elaborated by means of which the relative frequency of a given nuclear type can be estimated from plating data and nuclear counts.

954 Pittenger, T. H.
Dominance relations in *Neurospora* heterokaryons.
Genetics 1955 : **40** : p. 590. (Abst.)

The dominance of the wild-type allele of *pan* was investigated in heterocaryons with controlled nuclear proportions. Growth rate at 30° C. was normal when the proportion of *pan*$^+$ nuclei exceeded 3·5% and decreased very rapidly with lower percentages. The curves for rates of growth in response to added *pan*$^+$ nuclei and addition of pantothenate to the medium were similar in shape, 2% of *pan*$^+$ nuclei being equivalent to approximately 0·02μg. of calcium pantothenate per ml. Suboptimum rates produced by disproportion of nuclear types were seldom constant throughout 300–400 mm. of hyphal growth but were more uniform than the corresponding rates produced by limitation of pantothenate supply. Nuclear proportions underwent little alteration in 400 mm. of growth (cf. *PBA*, Vol. XXV, Abst. 2788).

955 Lockhart, W. R. & Garner, H. R.
Genetic mechanisms governing the effect of canavanine on *Neurospora crassa*.
Genetics 1955 : **40** : 721–25.

Evidence was obtained that resistance and sensitivity to canavanine are determined by two nonallelic genes, *R* and *S*, respectively, the *RS* genotype having an intermediate type of sensitivity and two genetically different sensitive types appearing, viz. *rS* and *rs*. A metabolic scheme is suggested in explanation of this genetic behavour.

956 Majeed Ahmad, & Mohammad Azeez Khan
Genetics of yeast.
Pakist. J. sci. Res. 1955 : **7** : 134–40.

A detailed account is given of investigations on *Saccharomyces carlsbergensis* already referred to in Abst. 195.

957 James, A. P., & Chaplin, C. E.
The effects of recessive lethal mutations in the heterozygous state in yeast.
Genetics 1955 : **40** : p. 577. (Abst.)

Approximately $1{\cdot}6 \times 10^7$ independent lethals were induced by ultraviolet irradiation among 10^8 cells. An initial decline in the number of heterozygotes suggested that the average effect was deleterious.

958 Lindegren, C. C., Shult, E., & Lindegren, G.
Tetrad analysis in Saccharomyces.
Genetics 1955 : **40** : p. 583. (Abst.)

"Tetrad analysis provides a level of information above single chromatid analysis for, in addition to the quantitative data revealed by single chromatid analysis, inspection of the three types of unordered tetrads yields certain specific qualitative information. When an excess of

tetratype asci beyond random expectation is found it indicates that a high frequency of single exchange has occurred between the two markers involved. This occurs in the proximity of centromeres and is consistent with the cytological observation of localized chiasmata. Linkage of two genes to two different centromeres is qualitatively indicated when ascus types I and II are equal and the tetratype is less than two thirds of the total number of asci. Linkage to centromeres can be measured if four different loci are linked to four different centromeres; the distances from gene to centromere and gene to gene across the centromeres check additively. Other reported solutions of this problem involving three genes are illusory since the equations proposed yield solutions irrespective of the existence of centromeres. An interesting unusual situation first reported by Von Wettstein is the occurrence of inverse linkage (which could naturally be detected as easily by single chromatid analysis). It is inferred that inverse linkage is the result of close linkage of two different loci to two different centromeres which undergo preferential segregation."

959 HAWTHORNE, D. C.
The use of linear asci for chromosome mapping in *Saccharomyces*.
Genetics 1955 : **40** : 511–18.

Genetical and cytological evidence indicated that the distribution of nuclei after meiosis in a diploid *Saccharomyces* hybrid results in the alternation of non-sister nuclei in the ascus. In a hybrid heterozygous for a given marker, deviations from the alternation of dominant and recessive spores in the asci indicated the occurrence of crossing over and afforded a means of determining the linkage of the locus to the centromere of its chromosome. A distance of about 2·5 units between the centromere and the gene determining independence of tryptophane was estimated from the linear asci of the diploid hybrid and confirmed from tetraploid material. The locus governing mating type was situated at about 27 units from the centromere, while the genes for melibiose and galactose (G–2) fermentation and histidine, uracil and methionine independence showed no centromere linkage.

960 ROMAN, H. & DOUGLAS, H. C.
Selection for mutants affecting adenine synthesis in yeast.
Genetics 1955 : **40** : p. 592. (Abst.).

A haploid, adenine-requiring mutant of *Saccharomyces cerevisiae* differs from the white, adenine-independent wild type by the presence of ad_2. Mutants derived from the pink form under aerobic conditions produce either white or pale pink colonies. Seven white types have been identified, one being the result of reverse mutation at the locus ad_2 and the other six arising through mutation to the recessive allele at the other loci and possessing the genotypes $ad_2\ ad_3$, $ad_2\ ad_4$, $ad_2\ ad_5$, $ad_2\ ad_6$, $ad_2\ ad_7$, and $ad_2\ ad_5\ ad_7$ respectively. Close linkage exists between the loci Ad_5 and Ad_7. The pale pink types represent mutation to an intermediate allele at one or another of the Ad loci.

961 ROMAN, H.
Mutational studies in yeast.
Genetics 1955 : **40** : p. 592. (Abst.).

"Ten independently-occurring recessive mutations of spontaneous origin have been obtained at the Ad_5 locus in *Saccharomyces*. The mutant cells require adenine for growth. At least four of the ten alleles differ from each other by the following test: Diploid cells containing two alleles of different mutational origin revert to adenine-independence with a frequency of about 1 in 10^7 cells; the reversion frequency is substantially lower if the two loci contain the same allele."

962 MOISEENKO, L. F.
(The selection of yeasts under industrial conditions).
Vinodelie Vinogradarstvo SSSR (Winemak. & Vitic. USSR) 1955 : No. 6 : 11–13. [Russian].

Active new strains characterized by production of high quality wines have been selected from Kahuri 7 and Kahuri 10 at Abrau-Djurso. Some ferment at temperatures as low as 10° C. and exceed the initial strains in alcohol yield.

963 HALPERÍN, D. R. DE & LOIZAGA, V. B. DE
Selección de levaduras de panificación aisladas de masa de pan fermentada y harinas. (**Selection of baking yeasts isolated from fermented dough and flours**).
Rev. Invest. agríc. B. Aires 1952 : **6** : 89–121.

A number of lines were obtained by single-cell selection from French-bread dough collected in commercial bakeries in Buenos Aires. The cultures were more varied than those obtained from dough of ordinary bread. Some of them had a higher fermenting power, expressed in speed and degree of raising, than the common strains obtained from pressed yeast or race XII of the National Collection of Type Cultures of

the Lister Institute in London. The morphological and other characteristics of the lines selected are described. Most of them are strains of *Saccharomyces cerevisiae* but some are *S. minor*.

964 Beam, C. A.
The influence of ploidy and division stage on the anoxic protection of *Saccharomyces cerevisiae* against X-ray inactivation.
Proc. nat. Acad. Sci. USA 1955 : **41** : 857–61.

The lethal effects of X rays administered in the presence and absence of oxygen to dividing and resting cells of *n*, 2*n* and 4*n* strains were compared. An approximately two-fold dose reduction was effected by anoxia in all cases.

965 Roman, H., Phillips, M. M. & Sands, S. M.
Studies of polyploid *Saccharomyces*. I. Tetraploid segregation.
Genetics 1955 : **40** : 546–61.

"Evidence is presented [from crosses between diploids involving the three markers $a\alpha$ controlling mating type, G_1g_2 governing rate of galactose fermentation and *Ff* causing flocculence in a liquid medium] to show that tetraploid segregation in yeast follows the pattern which could be expected of an orthodox meiosis. Tetraploids of genotype ++−− yield asci which exhibit phenotypic ratios of 4 : 0, 3 : 1, and 2 : 2, those of genotype +−−− yield 2 : 2 and 1 : 3 asci. The effect of multivalent pairing is seen in the occasional production of exceptional asci, which contain aneuploid spores.
"Calculations are made relating the frequency of second-division segregation to the frequencies of the three types of asci obtained from the ++−− tetraploid, thus providing a means of determining gene-centromere linkage. Two sets of calculations are given, one based on bivalent pairing, the other on tetravalent pairing. The observed frequencies of segregation for three loci suggest that both types of pairing occur.
"The problem of the occurrence of irregular asci is discussed in terms of polyploidy and its consequences." [Authors' summary].

966 Winge, Ö. & Roberts, C.
Identification of the maltase genes in some American haploid and European diploid yeasts.
CR Lab. Carlsberg 1955 : **25** : 331–40.

From spore x spore crosses involving strains from C. C. Lindegren's Carbondale Breeding Stock and from spore x cell crosses of the culture 1044–2b, obtained from D. C. Hawthorne, it is concluded that the *MA* gene of one of the former strains and the *Ma*–1 gene of the latter are identical with the gene M_1 in the present authors' material (cf. *PBA*, Vol. XXI, Absts. 856 and 1652).

967 Wild, D. G. & Hinshelwood, C.
The development of drug resistance in strains of *Saccharomyces cerevisiae*: resistance to 2.4-dinitrophenol and to brilliant green.
Proc. roy. Soc. 1955 : **144** : Ser. B. : 287–97.

Development of resistance to 2,4-dinitrophenol or to brilliant green (salt of tetraethyldiaminotriphenyl carbinol) is attributed to an adaptive physiological response rather than to selection of preformed mutants.

968 Brenes-Pomales, A., Lindegren, G. & Lindegren, C. C.
Gene control of copper sensitivity in *Saccharomyces*.
Nature, Lond. 1955 : **176** : 841–42.

Reaction to a medium containing $CuSO_4$ was controlled by one gene pair which was independent of the genes for mating type, fermenting abilities and nutritional requirements.

969 Vega, R.
Estudio comparativo de levaduras champañeras. (**Comparative study of champagne yeasts**).
Bol. téc. Fac. Cienc. agrar. Univ. Cuyo 1954 : No. 10 : Pp. 40.

Four strains imported from the Institut Pasteur in Paris, when compared with the local race commonly used in Argentina, proved slightly inferior in respect of the quality of the champagne produced.

970 Grasso, V.
A haplo-lethal deficiency in *Ustilago kolleri*.
Phytopathology 1955 : **45** : 521–22.

A sex-linked lethal is reported to occur in a collection of *U. kolleri* from Parma, Italy, basidiospores of one mating type proliferating freely and those of the other ceasing to grow after budding only a few times. The organism reproduces satisfactorily, however, when teleutospores are used to inoculate a susceptible oat variety, and dicaryotic aerial hyphae are produced when large numbers of teleutospores are allowed to germinate together on agar.

971 HASSEBRAUK, K.
Zur physiologischen Spezialisierung des Weizenbraunrostes (*Puccinia triticina* Erikss.) im Jahre 1953. [On the physiological specialization of brown rust of wheat (*P. triticina* Erikss.) in the year 1953].
Z. Pflanzenz. 1955 : **34** : 441–42.

Races 1 and 17 were the most prevalent races found in Western Germany in 1953. Races 15, 53, 93 and the new race reported in 1952 (cf. *PBA*, Vol. XXV, Abst. 100) were also identified.

972 LEVINE, M.
The production of lysogeny for virulent bacteriophage by mixed infection.
Genetics 1955 : **40** : p. 582. (Abst.)

Spontaneous clear-plaque mutants of the temperate, turbid-plaque wild type of phage PLT 22 occur with a frequency of approximately 10^{-3}. These mutants can be classified into three groups. Mutants of type III are temperate, with low frequencies of lysogenization. Mutants of groups I and II, either individually or in mixed infection within the same group, are virulent, carrying lytic responses with the lysogenization. Mixed infection with one member of I and another of II results in up to 50% survival of the bacteria, which give rise to stably lysogenic clones, the phage liberated being still virulent and almost exclusively of type I. This novel situation in which bacteria carry prophage of a virulent phage may account for natural reservoirs of virulent forms. Crosses between phage carrying the characters of I, II and III, in addition to other markers, showed normal segregation in the lytic cycle. Types I and III gave equal frequencies of lysogenization in mixed infection, whereas in mixed infection of type II with either I or III lysogenization with type II was exceptional.

973 LIEB, M.
Lysogenicity and immunity in *Salmonella typhimurium*.
Genetics 1955 : **40** : p. 583. (Abst.)

In order to explain the observation that lysogenic bacteria are immune from lysis by phage related to the carried phage, it has been postulated that prophage blocks the access of related phage to a nuclear site essential for initiating phage replication. Data have been obtained suggesting that although this hypothesis is still partly tenable, immunity does not imply the presence of a stable prophage.

974 MELECHEN, N. E.
The relationship of phage DNA synthesis to protein synthesis in replication of bacteriophage T2,
Genetics 1955 : **40** : p. 584. (Abst.)

Chloramphenicol is a specific inhibitor of protein synthesis in uninfected *Escherichia coli*. Its action on protein and DNA synthesis during phage reproduction was investigated by assaying incorporation of P^{32} and S^{35}. DNA synthesis was qualitatively independent of protein synthesis but chloramphenicol-sensitive processes were necessary for the activation of DNA synthesis.

975 STENT, G. S.
Decay of incorporated radioactive phosphorus during reproduction of bacteriophage T2.
J. gen. Physiol. 1955 : **38** : 853–65.

A gradual reduction in sensitivity to inactivation by P^{32} decay during the eclipse period was detected. This result is explicable in one of the three following ways: a process analogous to multiplicity reactivation; a change in the state of the deoxyribonucleic acid (DNA) prior to or in the course of its replication, this alteration rendering it refractory to destruction through P^{32} decay; or transfer of genetic factors from the DNA of the infecting phage to another substance insensitive to destruction.

976 STENT, G. S. & JERNE, N. J.
The distribution of parental phosphorus atoms among bacteriophage progeny.
Proc. nat. Acad. Sci. USA 1955 : **41** : 704–09.

"The descendants of highly P^{32}-labeled T2 or T4 bacteriophage are inactivated by radiophosphorus decay in a manner which indicates that the bulk of the atoms transferred from the deoxyribonucleic acid of the infecting parental virus particle to that of its progeny is distributed over no less than 8 and no more than 25 progeny particles". [Authors' summary].

977 BENZER, S.
Fine structure of a genetic region in bacteriophage.
Proc. nat. Acad. Sci. USA 1955 : **41** : 344–54.

Mutations occurring within the rII region of phage T4 all result in reduction of the host range. The wild type produces plaques on each of two strains of *Escherichia coli* B and K, whereas an rII mutant forms plaques only on B. The

failure of an rII mutant to mature in K can be overcome by the presence of a wild-type phage in the same cell, apparently because the latter type produces a substance or substances with respect to which the mutant is deficient. On the basis of phenotypic tests of position-effect pseudoallelism, the rII region is divisible into two functionally distinct segments, each estimated to contain approximately 4 x 10^3 nucleotide pairs. It is postulated that each segment determines the production of a specific polypeptide chain, the two chains later being combined to form an enzyme. The results so far obtained suggest that the elements separable by recombination are not larger than nucleotide pairs and that mutations affect various lengths of the region and may involve hundreds of nucleotide pairs.

978 BURTON, K.
The relation between the synthesis of deoxyribonucleic acid and the synthesis of protein in the multiplication of bacteriophage T2.
Biochem. J. 1955 : **61** : 473–83.

Experiments with aminoacid-requiring mutants of *Escherichia coli* suggested that after infection of the host cells synthesis of protein is essential for the initiation of synthesis of phage-specific deoxyribonucleic acid (DNA); production of phage DNA can continue independently of protein containing tyrosine or tryptophane but further synthesis of protein is required for the formation of mature phage.

CROP PLANTS

979 **Committee for Colonial Agricultural, Animal Health and Forestry Research, Tenth Annual Report.**
Colonial Research 1954–1955. HM Stationery Office, London, 133–221.

The report includes brief accounts of the chief projects being carried out on crop selection and breeding in the different countries served by the Colonial Research Council of the British Commonwealth. Most of the work in progress has already been referred to in *Plant Breeding Abstracts.*

980 **The work of FAO 1954-55.**
FAO UN, Rome 1955 : Pp. 123.

The section on Plant production briefly reports further progress in the following projects: development of hybrid maize in Europe; rice breeding in the east; and wheat and barley breeding in countries of the Near East.

Abnormal and pathological plant growth.
Brookhaven Symp. Biol. 1953 (1954) No. 6 : Pp. 303. (Mimeographed).

The following papers of interest to breeders were presented at the symposium.

981 *Kehr, A. E. & Smith, H. H. Genetic tumors in* Nicotiana *hybrids.* (*pp.* 55–78).

Tumours of genetic origin have been found to occur regularly in 26 hybrid combinations and occasionally in 20 other hybrids, the most frequent components of tumour-forming hybrids being *N. langsdorffii, N. sanderae, N. glauca* and *N. rustica.* In diploid or polyploid hybrids of *N. glauca* and *N. langsdorffii,* tumours were formed when each parent contributed one or more complete genomes; hybrids with an incomplete set of *N. glauca* chromosomes formed no tumours. Further evidence of the metabolic origin of genetic tumours is presented (cf. *PBA,* Vol. XXI, Absts. 2043 and 2901).

982 *Gunckel, J. E. & Sparrow, A. H. Aberrant growth in plants induced by ionizing radiation.* (*pp. 252–79*).

A brief review of the cytogenetic effects of ionizing radiations is included in this paper dealing chiefly with the morphological abnormalities produced by exposing plants to X, β or γ rays.

983 **Field experiments, 1952.**
J. Dep. Agric. Éire 1953–54 : **50** : 163–79.

Information is given concerning varietal trials of spring wheat, oats, barley and fodder beet at numerous centres in Éire.

984 **Report on the third crop conference held at the Cambridge Union Society on 14th and 15th December, 1954.**
J. nat. Inst. agric. Bot. 1955 : **7** : 388–462.

The following papers of interest to breeders were read at the above conference. E. T. Jones, speaking on The oat crop, discussed the influence of crop management, disease, climate and variety on yield. E. G. Thompson, in Results of recent oat variety trials, described the agronomic characters of British and introduced varieties that have done well in tests, particular reference being made to Milford and Maldwyn (cf. *PBA,* Vol. XXIV, Abst. 1052); a cross between S147 and S172 has shown promise and may prove useful where fertility is not high enough for growing S172. H. Lea's paper on Quality in oats and oat products from the provender miller's point of view included information on the fat content of different varieties.

T. J. Jenkin contributed a paper on The development of strains in grasses and clovers, in which he discussed the origin and history of local strains of perennial ryegrass and red and white clover in England and noted some of the distinguishing features of strains of these species and of timothy and Italian ryegrass bred at the Welsh Plant Breeding Station. In The classification of strains of grasses, R. P. Hawkins briefly discussed date of ear emergence, season of growth, disease resistance and proportion of germinating seeds becoming fluorescent under ultraviolet light and the importance of these characters in distinguishing strains. A. F. Kelly, in International assessment of grass and clover strains, outlined a project for establishing international varietal trials in 15 participating countries, under the auspices of the Organization for European Economic Cooperation.

985 Tätigkeitsbericht der Bundesanstalt für Qualitätsforschung pflanzlicher Erzeugnisse Geisenheim/Rheingau 1. April 1953 – 31.März 1954. (**Report on the activities of the Federal Institute for Research on the Quality of Crop Plants Geisenheim/Rheingau 1 April 1953-31 March 1954**) : Pp. 30.

Apple. Tabulated data are provided on the vitamin C contents of 134 varieties of European and North American origin.

Cabbage. Information is given on the cooking quality and contents of ascorbic acid, nitrogen, protein and sugar of a wide range of German varieties of white, red and Savoy cabbages.

Tomato. The American varieties Marhio and Red Jacket had considerably higher ascorbic acid contents than the German variety Rheinlands Ruhm [Rhineland Glory]. The fruits of wild forms of *Lycopersicon esculentum* and *L. pimpinellifolium* were found to contain a higher percentage of vitamin C per given weight of fresh fruit than any cultivated variety.

986 Sedljmaĭr [Sedlmayr], K. **(Plant breeding in Hungary along Mičurin's road).** Agrobiologija (Agrobiology) 1955 : No. 5 : 26–31. [Russian].

Breeding research, based on Mičurinist genetics, is outlined. Among the achievements mentioned are the maize hybrid M5 from Martonvásár, the sugar beet Beta K91 and the mangel Rozovaja Beta [Pink Beta], both from Sopronhorpács. All these are highly productive.

Institut National de la Recherche Agronomique. Rapport Annuel 1952. (**National Institute of Agricultural Research. Annual Report 1952**), Paris : Pp. 328.

987 *Station Centrale de Génétique et d'Amélioration des Plantes.* (*National Centre of Genetics and Plant Breeding*). (*pp. 88–107*).

Wheat. The F_4 and F_5 of hybrid 80–3 (cf. *PBA*, Vol. XXV, Abst. 758) x Étoile de Choisy [Choisy Star] and of Étoile de Choisy x 90–2 have proved highly resistant to black rust and frost. In variety trials, Cappelle gave the highest yields of grain. Étoile de Choisy reacted best with increased yields to higher levels of nitrogen fertilizer. In trials of varieties from the World Collection, Defiance, Fultz Nursery, Ballobar and Bergantinos proved highly resistant to yellow rust. Guatraché, Klein Cometa [Comet], Petirrojo and Fronteira were resistant to black rust, and Essex Pearl, Marsters' Ideal, Renown, Little Joss and Benefactor to foot rot (*Ophiobolus graminis*). Brief particulars of intergeneric crosses involving species of *Agropyron* and *Aegilops* are given. Genes for resistance to foot rot have been successfully transferred from *Ae. ventricosa* to *Triticum dicoccum*, *T. dicoccoides* and *T. persicum*. Fertile annuals have been obtained from the cross (*A. elongatum* x *T. vulgare* 'Géfir') x Vilmorin 27. Two fertile perennial hybrids with $2n = 47$ and 51, respectively, have been obtained from the back cross (*A. elongatum* x Progress) x Progress.

Oats. A number of French and North American varieties were tested for resistance to *Puccinia coronata* and *P. graminis*. Victoria, Hajira, Banner and Garry proved highly resistant to these two diseases and also possessed a fair degree of resistance to smut. Benton and Bonda* were resistant to *P. coronata*. The progeny of the double cross Aigle [Eagle] x (Markton x Binder) proved highly resistant to smut but require selection for increased yield. Line (Anthony x LM344) 84 proved highly resistant to crown rust and also gave high yields. The black-grained hybrid (Avoine de Versailles [Versailles oat] x Rigel) 181 gave exceptionally high yields. Crosses between Orion III on the one hand and Avoine de Versailles and Vega on the other and between Vega and Multigrap have given early-maturing, high-yielding selections.

Maize. Breeding for resistance to *Pythium* and *Gibberella* was continued. Many of the

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hybrid varieties recently developed by the Versailles Plant Breeding Station have proved superior in yield to hybrid introductions from the USA.

Barley. The principal aim of the breeding programme is the development of new mildew-resistant varieties and hybrids. Lines possessing complete immunity were selected from the progeny of Rika x Souche 142 de Colmar [Colmar strain 142]. La Estanzuela 75–A, Forrajera Klein, OM17 and Balladi 16 and the Yugoslavian varieties Y85, 90, 91 and 92 proved resistant to dwarf rust. Two physiological races of loose smut were isolated, the one attacking winter varieties and the other spring varieties. The American variety MOB575 was highly resistant to both races. Selections from the cross Bordia x Kenia possessed a high degree of resistance to lodging and gave yields 10–15% higher than those of Bordia. The cross Probstdorf x Kenia gave lines that tillered profusely, possessed a high degree of resistance to lodging and gave yields 5–10% higher than those of Probstdorf. These lines are now to be crossed with other varieties to improve their resistance to smut and dwarf rust, diseases to which they are at present highly susceptible.

Forage Plants. Brief information on the breeding of horse beans, lucerne, ryegrass, *Arrhenatherum elatius*, vetch, meadow fescue, red and white clover, birdsfoot trefoil and *Dactylis glomerata* is given. It was shown that the gradual change observed in the colour of the flowers of some lucerne plants after the bud opens was a hereditary character determined on a tetrasomic basis (cf. *PBA*, Vol. XXV, Abst. 1143). The results of studies on the effects of inbreeding on the yield and vegetative vigour of lucerne and *Dactylis glomerata* are reported. Populations of *D. glomerata* from different parts of France were examined and differences between ecotypes as regards earliness and resistance to diseases, especially rust, were noted. Selection of red clover for resistance to *Sclerotinia trifoliorum* and mildew continues. Inbreeding in red clover was found to increase resistance to mildew without depressing yield to any significant extent. Horse-bean varieties from North Africa were crossed with high-yielding varieties such as Lorraine, Picardie, Strube and Oberbehmer Dicke [Oberbehm Plump] to improve the earliness of the latter varieties. Interspecific crosses involving *Lolium perenne*, *L. temulentum* and *L. remotum* gave vigorous plants possessed of a high degree of fertility.

Potato. The results of a number of interspecific crosses of *Solanum tuberosum* with *S. demissum* and *S. antipoviczii* are reported. Many of the hybrids obtained were resistant to races of late blight hitherto encountered at Versailles, but a race of the pathogen capable of attacking the new hybrids has apparently already appeared. Inbred lines were found to possess improved resistance to late blight. In variety trials, Hyva, Arvor and Bintje gave the highest yields of the early varieties tested and Ackersegen, Kerpondy and Industrie [Industry] were the most productive among the late varieties. Of varieties suitable for the industrial extraction of starch, Voran [Onwards] and Kotnov were significantly superior to Ostbote [Eastern Messenger].

Flax. The French variety Île-de-France outyielded the Dutch varieties Solido and Formosa by a considerable margin. The crosses Priekuli x (Kostroma rose [Kostroma Pink] x Crésus) and Priekuli x Fleur rose de Gembloux [Gembloux Pink-flowered] gave high-yielding hybrids possessed of good agronomic characters. A number of crosses were made between flax and linseed varieties with a view to obtaining high-yielding dual-purpose varieties.

Hemp. A number of monecious strains were developed from varieties of French and Mediterranean origin.

Sugar beet. Breeding for resistance to *Cercospora* and yellows was continued. Kleinwanzleben CR and the American varieties GW248 and GW443 were found to possess a high degree of resistance to *Cercospora*.

Oil plants. The results of intervarietal crosses of linseed and oil rape are given.

Tomato. No evidence was obtained in support of the claim by Russian research workers that the scion of a tomato variety grafted on to another variety produces an F_1 in which the characters of both stock and scion are combined.

988 *Station d'Amélioration des Plantes de Clermont-Ferrand.* (*Plant Breeding Station, Clermont-Ferrand*). (*pp. 107–11*).

Wheat. The primary breeding objectives at this station are improved baking quality and increased resistance to frost, rust, smut, bunt and mildew. With these aims in view and to obtain hybrids with as wide an ecological range as possible, crosses have been carried out using Magdalena, Blé des Dômes, Oro and Vilmorin 27 as parents. The results of variety trials conducted at this station are presented.

Oats. Crosses have been effected between Montferrandaire and a number of black-grained varieties with a view to obtaining a black-grained variety with improved agronomic characteristics. Several promising selections

have been made from the local land race Grise de Craponne [Craponne Grey]. Breeding for resistance to black rust is receiving priority. Selections from the crosses Mindag x Romana, Richland x Rouge d'Afrique [African Red] and Richland x (294 x Prieuré [Priory]) have proved highly resistant to crown rust.

Maize. A number of inbred lines and top-crosses are being developed.

Barley. Probstdorf has been crossed with a number of other varieties with a view to improving its malting qualities.

989 *Station d'Amélioration des Plantes de Dijon.* (*Plant Breeding Station, Dijon*). (*pp. 111–14*).

Cereals. The results of trials of cereal varieties and of maize varieties for silage and grain are presented. Of the wheat varieties tested, Minhardi and Alsace 22 proved highly resistant to frost. Étoile de Choisy [Choisy Star], Aisne, Cappelle and Franc Nord gave the highest yields.

Hops. The comparative suitability of a number of English and French varieties for brewing was determined.

990 *Station d'Amélioration des Plantes de Colmar.* (*Plant Breeding Station, Colmar*). (*pp. 115–16*).

Cereals. A short account of cereal varieties at the station is presented, together with a brief note on current breeding objectives.

Potato. Urgenta gave the highest yields of the early varieties tested; Kerpondy was the most productive of the late varieties. Voran [Onwards] and Kotnov gave the highest yields of starch.

991 *Station d'Amélioration des Plantes de la Chaire d'Agriculture de l'École Nationale d'Agriculture de Rennes.* (*Plant Breeding Station attached to the Chair of Agriculture of the National School of Agriculture at Rennes*). (*pp. 116–21*).

The results of variety trials of cereals, flax, linseed, potato and forage plants are presented.

Cereals. In the wheat-breeding programme, a number of crosses have been effected between (5–2–1 x Oro) 80–3 on the one hand and Vilmorin 27 and Yga on the other with a view to developing high-yielding hybrids resistant to brown rust. In the barley-breeding programme, breeding for resistance to smut and lodging are receiving priority. Selections from the barley variety Île de Ré have proved highly resistant to brown rust and have given high yields.

992 *Station d'Amélioration des Plantes de Montpellier.* (*Plant Breeding Station, Montpellier*). (*pp. 121–27*).

Cereals. Data are presented on the disease resistance and potential value as breeding material of varieties of wheat, oats and barley at the station.

Maize. The disease resistance and yields of a number of American hybrids are compared with those of hybrids developed at Montpellier. Breeding for resistance to drought, high temperatures, rust, *Macrophomina phaseoli* and *Gibberella zeae* is being undertaken.

Rice. Breeding for resistance to lodging and shattering is being continued. Balilla and Stirpe 136 [Line 136] are the varieties best adapted to mechanical harvesting and will be crossed with other varieties to improve the quality of their grain.

993 Institut National de la Recherche Agronomique. Station Centrale de Génétique et d'Amélioration des Plantes. Rapport d'activité pour l'année 1954. (**National Institute of Agronomic Research. Central Station of Genetics and Plant Breeding. Report of activities for the year 1954**): Pp. 118. (Mimeographed).

The results of the major part of the research work carried out at the Central Station of Genetics and Plant Breeding, Versailles, in 1954 have been summarized already in *Plant Breeding Abstracts*. The following constitutes a brief summary of the contents of the above annual report.

Wheat. *Aegilops ventricosa* has proved highly resistant to *Fusarium* foot rot and has been used in crosses with a number of cultivated wheat varieties in addition to being crossed with *Triticum persicum* and *T. timopheevi*. The results of a number of crosses between *Agropyron* spp. and *T. vulgare* are given. *T. ventricopheevi* has been crossed successfully with *T. vulgare*. Studies on varietal differences in developmental physiology and period to maturity were carried out with a view to obtaining information on the genetical causes of such differences; Vilmorin 27, Fylgia and Étoile de Choisy [Choisy Star] were the varieties used. Resistance to black rust at both the juvenile and the adult plant stage was found to depend upon the interaction of two genes situated at different loci. Resistance to smut was dominant in crosses involving Vilmorin 27 and was determined by two complementary factors. Varietal differences in resistance to mildew and *Fusarium* foot rot are noted. Selection was carried out for higher yield, improved

baking quality and resistance to cold, lodging, black and yellow rust, smut and mildew. The results of genetical studies on grain size and number of grains per ear are reported.

Oats. The results are given of morphological and physiological studies of oats included in the French list of officially approved varieties. Aigle [Eagle], Flamande [Flemish], Blanche de Wattines [Wattines White] and Trophée [Trophy] proved comparatively resistant to *Septoria avenae*. Of these varieties, Aigle proved the most suitable in crosses with susceptible varieties. A number of American introductions were tested for resistance to rust and smut and crosses were effected between American and French varieties. The F_8 of Aigle x (Markton x Binder) and the F_6 of Soleil II [Sun II] x Richland possessed a high degree of resistance to loose smut.

Maize. Selection for resistance to low temperatures and soil fungi is being carried out. Crosses were effected between varieties of French and American origin. A number of new inbred lines have been developed.

Barley. Varietal differences in the resistance of a number of winter barleys to frost and lodging are noted. Hâtif Bonte [Bonte Early] proved highly resistant to low temperatures. Hâtif Bonte and Bordia gave the highest yields in 1953–54 but it is pointed out that the former variety is unreliable as regards its yield, which varies considerably from year to year. Among the spring barleys, Piroline and Agio proved the most resistant to diseases. Details are given of breeding for resistance to *Puccinia simplex*. Varietal differences in yield, period to maturity and resistance to rust, mildew and lodging are noted.

Forage plants. The results of variety trials and breeding work on vetch, peas for fodder, lucerne, horse beans, red and white clover, timothy, oat grass, cocksfoot, meadow fescue, perennial ryegrass and birdsfoot trefoil are given. New strains of vetch resistant to low temperatures are being developed and the breeding of high-yielding, early-maturing varieties is receiving priority. The results of genetical studies on the inheritance of flower colour in lucerne are reported; selection of lucerne for resistance to *Peronospora trifoliorum* and *Sclerotinia trifoliorum* is being undertaken.

Mangel. Extensive tabular data are provided on the results of variety trials. A wide range of crosses has been carried out between mangels and sugar beets.

Potato. The late-blight resistance of clones of *Solanum demissum, S. stoloniferum, S. polyadenium* and *S. andigenum* was tested. Polyploid forms of *S. chacoense, S. simplicifolium* and *S. polyadenium* were obtained by colchicine treatment to enable them to be crossed with cultivated potatoes; *S. chacoense* and *S. simplicifolium* are highly resistant to certain viruses and *S. polyadenium* possesses a high degree of resistance to late blight. The search for varieties with early tuberization is being continued; of the varieties examined so far, Sirtema is superior in this respect. A number of crosses have been carried out between cultivated potatoes to obtain new varieties resistant to late blight and to study the mode of inheritance of blight resistance. Selections from the crosses Arran Pilot x Bonnotte de Noirmoutier, Arran Pilot x BF15 and Industrie [Industry] x Frühmölle have given exceptionally high yields.

Flax. Lines 80–2 and 1–5–2 and the hybrid Priekuli 665 x (Kostroma x Crésus) 125 have given good results as regards yield and fibre quality. The results of variety trials of flax, linseed and dual-purpose flax are given. Genetical studies on the inheritance of flower and seed colour have been undertaken.

Sugar beet. This section is devoted to the results of variety trials, including trials of polyploid varieties, and to an account of breeding work at Versailles. The selection of forms resistant to *Cercospora* sp. and yellows is being continued. The results of studies on male sterility in the sugar beet are reported. A number of interspecific hybrids have been obtained. Selection of monogerm beets for higher yielding capacity is being undertaken.

Rape. Data on varietal differences in resistance to low temperatures are given; selected lines from the variety Lembke proved highly satisfactory in this respect. Information on breeding, selection, and variety trials at the station is given, together with data on the results of genetical studies on the inheritance of flower colour.

French bean. Several new varieties resistant to mosaic, halo blight or anthracnose are being developed. Varietal differences in resistance to cold are noted. In variety trials, Canning King, Pinto, Perche bleue [Blue Perch] and Coco nain blanc [Dwarf White Coco] gave the best results.

994 Estación Experimental de Aula Dei. Departamento de Mejora. Ensayos 1954–1955. **(Aula Dei Experimental Station. Department of Breeding. Tests 1954-55).** Pp. 19. (Mimeographed).

Data are given on yields and other properties of

some selections made at the station from a number of standard varieties of wheat. Several off types such as club forms of Libero and Roma, giant forms of Libero and awned forms of Florence-Aurore are inferior in yield and are to be eliminated. Others such as an erect type of San Rafael, a smooth-awned type in Andalucía 344 and glaucous types in Florence-Aurore appear promising and are to be investigated further.

995 Hankkijan harjoittaman jalostustyön tuloksia, 1950–54. (**Results of breeding work in the Hankkija variety trials, 1950-54**).
Siemenjulk. Hankkijan KasvinjalosLaitos Tammisto 1955 : 15–112.

Spring wheat. Breeding for strength of straw and earliness has been the principal aim. Comparative data for several native and foreign varieties in comparison with Timantti [Diamond] show significant increases in yield for Kärni [Kernel], Svenno, Rival and Drott [King], all of which except Rival have considerably stronger straw, but, with the exception of Svenno, a longer ripening period, than Timantti. The variety Tammi remains the most satisfactory as regards straw stiffness and earliness, although it is not heavy yielding, while the recently introduced variety Terä [Edge] (line a3455) combines earliness with better yielding and baking qualities than Tammi.

Winter wheat. Data are given for several lines, compared with Varma [Sure] as standard; these deal with grain yield, stiffness of straw, overwintering capacity and date of ripening. As regards yield the most significant increases were given by a3474 (09114 x Olympia) and a4222 (07147 x Varma) but these showed no superiority over the standard in other respects. Winter hardiness is greatest in a3757 [F_1(01216 x Svea) x Ukrainka], while straw stiffness reaches its peak in the Jokioinen variety Vakka [Bushel], which also ripens 5 days earlier than the standard.
Further data are given for similar trials carried out on sandy soil, in which the only line giving a significantly higher yield was 480627 (Olympia x a3188).

Oats. Crossing experiments designed to produce varieties which ripen early and have stiff straw combined with superior quality have continued. Strains were compared with Kultasade II [Golden rain II]; the highest yield was given by 0809 (Vaasa x 02272), which has good straw and ripens at the same time as Sisu. Ta693 (Vaasa x 02272) is also promising. Eho is slightly earlier and favoured in central Finland, while Tammi is most suited to northern conditions, being even earlier. Ta259 (07505 x Tammi) yields poorly but is very early and has good straw.

Winter rye. Data are given for grain yield, strength of straw, date of ripening and winter hardiness of several varieties compared with Toivo as standard, but no significant differences were obtained. Susceptibility to lodging is the most unsatisfactory feature of this crop and efforts are being made to breed stronger-strawed varieties from tetraploid rye.

Barley. Among six-rowed varieties, Tammi, the standard in the trials, gave the best yields although these were not significantly greater than most of the other strains tested. Of these Pirkka was particularly successful in central Finland and has good kernel and malting properties. No variety was found significantly earlier than Tammi and all had weaker straw. Two-rowed barleys were compared with Balder. Bonus showed somewhat higher yield, but the differences were not significant, nor were other features improved.

Cocksfoot. Foreign strains, principally Danish, and one other Finnish strain were compared with the standard Tammisto variety. The need is for high-yielding strains which ripen late. Those giving significantly higher yields than the standard were the Danish Roskilde I and Roskilde Late and the Finnish strain JoD70, which also ripened up to two days later in some of the trials.

Timothy. Data for yield and aftermath of several indigenous and foreign varieties are provided for each year of three-year leys. JoPh132 and JoPh171 gave the best yield but a poor aftermath, while varieties giving good aftermath were low yielding initially.

Meadow Fescue. A number of varieties, mainly foreign, have been tested against the Tammisto strain as standard. Results for different qualities showed little correlation, but Tammisto had the advantages of late ripening, winter hardiness and lower density of flower stalks; its yield however was comparatively poor. Best yields were obtained from the Finnish Paavo, the Svalöf late strain and the Danish Øtofte and Øtofte I strains.

Red fescue. Foreign varieties have been tested against the standard Tammisto, and of these the Danish Øtofte and Swedish Rubin gave better yields in the first year of leys, but the

differences in the second and third year were not significant.

Ryegrass. The standard variety in the trials was Valinge, which is also the hardiest and gives good crops even in the third year of leys, although other strains give significantly larger crops in the first year. Of these the Danish varieties E. F. Hunsballe I, Trifolium Late, Øtofte Late and the Swedish Viris provide a better aftermath.

Red clover. A number of Finnish strains were tested for yield, protein content and winter hardiness. The variety Fiskars gave a good yield in the first year of leys, while Ta sl–10 and Jo37 surpassed the standard Tammisto in the second year. This last variety is also the most hardy. Foreign varieties on the whole were found to compare unfavourably with the standard, only the Swedish Ultuna giving significantly better yields in the first year. Protein content was higher in some foreign varieties, however, especially in the Swedish Merkur and Ultuna, and the Danish Hinderupgaard II.

White clover. Several foreign strains tested against the native Tammisto strain showed significantly greater yields under favourable conditions but owing to insufficient winter hardiness are unreliable for cultivation in Finland.

Alsike clover. Comparison of foreign varieties with the native Tammisto strain has shown definite superiority in the Swedish Tetra in respect of yield, hardiness and protein content.

Potato. Extensive data are provided on yield, resistance to blight and virus diseases, and culinary and keeping qualities. Of early potatoes Sieglinde and Frühbote are recommended and also Jaakko, which is high yielding and with a high starch content.

Of early main-crop varieties, Frühnudel is the highest yielding. The Tammisto line 01783 (Pepo x Aquila) has a high yield, good quality and high resistance to blight. Of later varieties the Swedish Anna is the best yielding; Aquila, while of lower yield, is the most blight resistant of the varieties tested.

A number of Dutch varieties were also tested, of which Bintje gave the highest yield.

Flax. Trials included native and foreign varieties grown both for oil and fibre. In the first category the native small-seeded early strains Vaanila and Tikkurila gave first class oil. For fibre the Swedish Gerda and Kristina and Dutch Fivel, Wiera and Percello give the best yields of straw.

996 HUTTUNEN, E.
Tammiston kasvinjalostustoiminnan historiikkia v. 1913–1954. (**History of the work of the Tammisto Plant Breeding Station, 1913-54**).
Siemenjulk. Hankkijan KasvinjalosLaitos Tammisto 1955 : 180–202.

A review of the research work done by this station is given, and includes data on new varieties of cereals, herbage plants, peas and potatoes which have been released.

997 LINJA-AHO, M. & LEINONEN, V.
Hankkijan koetila Anttila. (**The Anttila experimental farm of Hankkija**).
Siemenjulk. Hankkijan KasvinjalosLaitos Tammisto 1955 : 203–16.

An account of the work done on this farm since 1942 is given. It includes breeding work on winter rye, winter wheat and potatoes.

998 JURJEV, V.
(**Our research methods**).
Kolhoz. Proizvod. (Collect. Fm. Prod.) 1955 : No. 12 : 40–41. [Russian].

DIDUSJ, V.
(**New varieties of winter wheat**).
Ibid. 1955 : No. 12 : 41–42. [Russian].

(**The institute's breeders on new varieties**).
Ibid. 1955 : No. 12 : p. 42. [Russian].

These accounts of breeding work on cereals at the Harjkov breeding station refer to the following new productive varieties.

Wheat. Recent selections of spring wheats include Otečestvennaja [Fatherland], which shows resistance to smut and bunt, and Harjkov 46, a hard wheat which does not lodge and is tolerant of drought. The winter wheats Lutescens 20, Velutinum 32 and Erythrospermum 29 have been obtained by intervarietal hybridization and training upon rich soil. They are all characterized by good baking and milling properties, hardiness and resistance to rust and lodging. All of them outstrip the standard Odessa 3 in yield. Lutescens 266 (Ukrainka x Jurjevka) combines high quality with hardiness, tolerance of *Phytophaga* and resistance to bunt, smut and lodging. Breeding firm-strawed varieties for cultivation on irrigated land has involved crosses of the short-culmed forms 1783/2 and 97–114–N315 with such varieties as Lutescens 17. The wheats Zolotistaja [Golden] and Sizaja [Grey] thus obtained are exceptionally early and withstand lodging and diseases. The productiveness and grain and straw quality of Zenitka [Zenith] and the hardiness, tillering

capacity and grain setting of Lutescens 17 have been improved by selection.

Rye. Mention is made of a new lodging-resistant variety Harjkov 55, obtained by inter-varietal open pollination of the standard Harjkov 194. It outyields the standard by 3·9 c. per ha.

Maize. A hybrid between two inbred lines, Harjkov 1, is referred to briefly. In the Harjkov province it surpasses VIR 25 [Plant Industry 25] in earliness and yield.

Millet. Harjkov 2534 has better flavour than such older varieties as Veselyĭ Podol 367 and outyields Harjkov 436 by 2·4 c. per ha.

999 **Prominent Danish varieties and strains of agricultural and horticultural plants 1955.**
K. danske LandhusholdSelsk., Kbh. 1955 : Pp. 16.

Brief descriptions are given of some of the best Danish strains and varieties of cereals, legumes, grasses, root crops and vegetables tested in recent years by the Danish State Experimental Service for Plant Culture.

1000 Árni Jónsson (Editor)
Skýrslur tilraunastöðvannar á Akureyri árin 1951 og 1952. **(Reports of the research stations at Akureyri in 1951 and 1952).**
Rit Landbúnaðardeildar 1953 : No. 6 : 5–25.

Among the topics summarized in this publication are reports of varietal trials, in particular of potatoes, brassica crops, cereals and forage grasses, at the Akureyri, Reykhólar, Sámsstaðir and Skriðuklaustur research stations.

1001 Sprenger, A. M.
Overpeinzing bij het vraagstuk der nieuwe rassen. **(Thoughts on the question of new varieties).**
Fruitteelt 1955 : **45** : p. 979.

The author discusses the question as to why so much attention is paid to breeding new varieties and whether the new varieties developed are really superior to the long-established ones. He points out that new varieties often possess improved disease resistance and give higher yields but stresses, on the other hand, the necessity on the grower's part of ensuring that a given new variety is better adapted to the conditions under which it is to be grown than are old-established varieties that have already proved their worth.

Verslag van het Centraal Instituut voor Landbouwkundig Onderzoek over 1954. **(Report of the Central Institute for Agricultural Research, Wageningen, for 1954).** 1955 : Pp. 271.

The above report includes the following articles of interest to plant breeders:—

1002 *Riepma Wzn, P. De daglengtereactie van erwten.* (*Day-length response in peas*). (*pp. 166–71*).

Ten varieties of canning peas were tested as to their optimum photoperiodic requirements. Gloire de Quimper [Quimper Glory], Alaska and Kelvedon proved to be day neutral. Trophy, Balder, Rondo, Serpette cent pour un [Pruning-knife Hundred for One], Selkirk, Ideal and Celsior were dependent upon long-day conditions; of these Trophy required the relatively longest photoperiods and Celsior the shortest.

1003 *Becker, W. R. De daglengtereactie bij mais.* (*Day-length response in maize*). (*pp. 171–76*).

Varietal differences in the optimum photoperiodic requirements, under Netherlands conditions, of the Dutch variety Goudster [Golden Star] and several American varieties of different maturity groups are noted. It was found that early-maturing varieties are less influenced by short photoperiods than are late-maturing varieties. The importance of response to day length in breeding hybrid maize is discussed briefly.

1004 *Friederich, J. C. Resultaten van het rassenonderzoek bij olievlas en van het onderzoek van de factoren, die zaadopbrengst en vetgehalte kunnen beinvloeden.* (*Results of research on linseed varieties and on factors that can influence seed yield and oil content*). (*pp. 214–19*).

Tabulated data are presented on the yields of seed and straw per acre, 1000-seed weight and average number of capsules per plant and seeds per capsule of eight varieties tested at Wageningen in 1953–54. A brief mention is also made of varietal differences in susceptibility to *Alternaria* sp., which causes heavy losses in the Netherlands. The French variety Pastel gave the highest yields of seed and oil. Its superior performance is attributed to its high 1000-seed weight, the high oil content of its seeds and its rapid vegetative growth and broad leaves, which enable it to suppress weed growth. Agronomic factors influencing the oil content of the seeds are also discussed.

1005 *Harberts, C. L. & Immink, H. J. Aanvullend onderzoek naar het blauwzuurgehalte van enkele witteklaverrassen* (Trifolium repens *L.*). [*Supplementary research on the hydrocyanic acid content of some white clover strains* (T. repens *L.*)]. (*pp. 231–32*).

It was found possible to substantiate previous findings on the low HCN content of certain strains of white clover (cf. *PBA*, Vol. XXII, Abst. 473) by testing with enzyme prepared from white clover with a high HCN content.

Principales indications pratiques résultant d'essais effectués en 1954 à la Station de Recherches, de l'État, pour l'Amélioration des Plantes de Grande Culture, à Gembloux. (**The main practical conclusions drawn from trials carried out in 1954 at the National Research Station for the Breeding of Crop Plants at Gembloux**).

Rev. Agric., Brux. 1955 : **8** : 1012–1131.

1006 *Moës, A. Le comportement des orges d'hiver en 1953–1954.* (*The behaviour of winter barleys in 1953–54*). (*pp. 1013–15*).

In trials of winter barley varieties during 1953–54, Mansholt II and Fletumer proved the most resistant to low temperatures. Urania and the new variety Manon possessed a high degree of resistance to *Erysiphe graminis*.

1007 *Moës, A. La production des orges de printemps en 1954.* (*The production of spring barleys in 1954*). (*pp. 1016–18*).

Piroline (cf. *PBA*, Vol. XXIV, Absts. 319 and 327) outyielded all other varieties and proved highly resistant to drought and *Erysiphe graminis*.

1008 *Noulard, L. Essais sur variétés de froment d'hiver.* (*Variety trials of winter wheat*). (*pp. 1019–24*).

Tabulated data are presented on yield, period to maturity, length of straw and resistance to mildew, rust, loose smut, foot rot and lodging. Ministre [Minister] and Leda gave the highest yields and were also the varieties most resistant to lodging. Breeding for resistance to low temperatures is being continued. A number of new lines giving higher yields than the control Panter and possessed of good resistance to cold, foot rot and lodging have been developed.

1009 *Noulard, L. Essais sur de nouvelles variétés de froment de printemps.* (*Trials of new varieties of spring wheat*). (*pp. 1025–28*).

Data on yield, period to maturity, length of straw and resistance to mildew, loose smut and lodging are presented for nine varieties recently released in Belgium or introduced from neighbouring countries. Jufy I and II gave the highest yields and were the varieties most resistant to lodging.

1010 *Lorent, J. Le comportement en 1954 des races nouvelles d'avoine étudiées à la Station de Recherches de Gembloux.* (*The behaviour in 1954 of new varieties of oats studied at the Gembloux Research Station*). (*pp. 1029–33*).

A number of new varieties recently developed at Gembloux are described and the results are given of variety trials in which they were included. R37, from Blanche rigide [Stiff White] x Blanche du Vieux Moulin [Old Mill White] is a highly productive white-grained variety. It suffers, however, from the defect that its straw is weak and of inferior quality. R41, from Blanche rigide x Espoir [Hope] is a high-yielding, medium-early variety producing grain of fairly good quality. R53, from Aigle [Eagle] x Blanche du Vieux Moulin, gives yields comparable with those of Blanche du Vieux Moulin but is superior to the latter variety in resistance to lodging. R56, from von Lochow x L6 (Triomphe [Triumph] x Ligowo-Brie), is a yellow-grained early-maturing variety. It yields well and is highly resistant to lodging.

1011 *Lorent, J. Le comportement en 1954 des variétés de lin à la Station de Recherches de Gembloux.* (*The behaviour of flax varieties at the Gembloux Research Station during 1954*). (*pp. 1034–37*).

Varietal differences in straw quality and resistance to *Fusarium lini*, *Botrytis cinerea* and lodging are noted. Arc-en-Ciel [Rainbow] and Solido gave the best all-round performances and proved highly resistant to *F. lini*, *B. cinerea* and lodging. The highest yields were obtained from Formosa but this variety was extremely susceptible to lodging.

1012 *Derenne, P. L'amélioration de la féverole.* (*Breeding horse beans*). (*pp. 1038–39*).

Minor, a new variety recently selected at Gembloux, is described. It matures early, is moderately resistant to diseases and lodging and produces high yields of small beans of excellent quality. It is best adapted to soils of medium to high fertility. Its 1000-seed weight varies from 350 to 450 g.

1013 *Cantillon, P. Essais sur vesce commune de printemps.* (*Trials of common spring vetch*). (*pp. 1040–46*).

Data on yield and resistance to *Botrytis cinerea*

and anthracnose are presented and a brief account is given of selection in progress at Gembloux.

1014 *Cantillon, P. Essais sur tabac.* (*Tobacco trials*). (*pp. 1047–48*).
The experimental hybrids H23–1, H27–5, H27–8 and H27–10 (cf. *PBA*, Vol. XXV, Abstr. 783) outyielded the control Philippin and Lignée 8 de Chairière [Chairière line 8] by a wide margin.

1015 *Derenne, P. Essais régionaux.* (*Regional trials*). (*pp. 1049–53*).
The results of trials of cereal varieties and horse beans at the Steenkerque-lez-Enghien, Ciney and Libramont substations are presented.

1016 *Legros, R. Résultats des analyses chimiques et technologiques des produits récoltés dans les essais exécutés par la station en 1953.* (*Results of chemical and technological analyses of the products harvested in trials at the station in 1953*). (*pp. 1054–60*).
Tabulated data are presented on the quality and technological properties of the grain of wheat and barley varieties included in variety trials carried out at Gembloux in 1953.

1017 Georgieva, R.
(Mičurinist science and the progress of biology in Bulgaria).
Agrobiologija (Agrobiology) 1955 : No. 4 : 284–90. [Russian].
The results of breeding research based on Lysenko's methods are briefly surveyed. Reference is made to new varieties of cereals notable for productiveness and resistance to diseases, among them a multiple wheat hybrid from Knež which shows resistance to low temperatures and lodging. At Čirpan, a new high-yielding long-fibred cotton variety has been developed. The following are the most remarkable instances of interspecific conversions observed in recent years in Bulgaria: (1) *Festuca myurus* → *F. dertonensis*, (2) *Lotus corniculatus* → *L. angustissimus*, (3) *Vicia cracca* → *V. gerardii*, (4) *Avena sativa* → *A. fatua* and (5) *Vicia sativa* → *V. villosa*.

1018 Daskalov, H.
(Some achievements of Bulgarian horticulture).
Agrobiologija (Agrobiology) 1955 : No. 4 : 291–98. [Russian].
Problems connected with heterosis have been investigated and tomato, egg plant and *Capsicum* varieties which give heterotic hybrids are described. Lines 40/1 and 20/1 of the tomato Plovdivskiĭ Konservnyĭ [Plovdiv Processing] have been developed in recent years.
The yield of the egg plant is improved by grafting on to a tomato stock and the yield of water melons by grafting on *Lagenaria vulgaris*. Data on the yields of the grafted and ungrafted material are presented.

1019 Prjadčenku [Priadcencu], A.
(Achievements of plant breeding in the Rumanian People's Republic).
Agrobiologija (Agrobiology) 1955 : No. 4 : 299–304. [Russian].
The following recent achievements in plant breeding research, which has involved vegetative hybridization, the use of pollen mixtures and other Mičurinist techniques, are reported.
Wheat. A productive winter type with good macaroni properties has been selected from a spring variety of Arnautka in Oltenia, also a high-yielding spring wheat has been obtained by training a hybrid between winter wheats for the spring habit.
Oats. Productive winter varieties have been produced by training the spring oats Cenad 749 and Turgu-Frumos for the winter habit.
Potato. Hybrids between domestic varieties and *Solanum andigenum* or *S. demissum* have been produced by combined vegetative and sexual hybridization. The wild species imparted hardiness and resistance to drought, *Phytophthora* and black rot to the hybrids. The material is now being back-crossed to domestic potatoes to minimize the unwanted effects of the wild species.
Tomato. Vegetative hybrids between *Capsicum* and tomato have been produced. They are interesting for high vitamin content and good transportability.
Apple. A high quality variety has been developed by grafting Golden Pearmain on *Malus paradisiaca* and fertilizing the flowers of the scion by Jonathan.
Vine. Muscat flavour, early ripening and improved fertility have been imparted to various hybrids by grafting them on appropiate stocks.

1020 **Scientific reports of the Indian Agricultural Research Institute for the year ending 30th June, 1954** (1955) : Pp. 127.
Wheat. Breeding is now directed towards introducing resistance to a particular rust from diverse sources; accordingly single, double, multiple and back crosses involving indigenous and foreign resistant wheats have been made. Tests were carried out on the progenies of over

800 crosses and on local and introduced wheats for their reactions to races of black, brown and yellow rusts at the seedling and adult stages. NP801 was highly resistant to all three rusts at the adult-plant stage. Yield trials of new NP wheats were conducted at approximately 150 centres. NP797, NP798 and NP799 gave outstandingly high yields; they are highly resistant to loose smut and, at the adult stage, to all three rusts.

Improvement of *Triticum durum* is under way at Indore. Alapur 6–1, a local selection, has shown promise at three centres.

In the F_4 of *T. vulgare* x *T. pyramidale*, 6*n* and 4*n* segregates with ear characters of the 4*n* and 6*n* parents respectively were isolated. Nullisomics were also secured. Meiotic investigation of the F_2 of *T. vavilovi* x *T. vulgare* revealed that the heterozygous segmental interchange observed in the F_1 was not involved in the inheritance of the branched ear of *T. vavilovi*. Seeds have been obtained from F_1 wheat-rye hybrids treated with colchicine.

Caryotypical studies were carried out on *Triticum* and *Aegilops* spp. In *T. macha* two pairs of nucleolar chromosomes, each with supernumerary constrictions separated from the secondary constrictions by a minute intercalary segment, were observed. Two morphologically distinct chromosomal types of *T. dicoccum* were identified (cf. *PBA*, Vol. XXV, Abst. 914).

In the case of NP798 and Gabo x Niphad 4 selection for ear and grain number in potted plants exposed to drought conditions led to improvement in resistance to such conditions in the succeeding generation.

NP770, suitable for high altitudes in Himachal Pradesh and resistant to yellow rust and loose smut, was released.

Maize. Inbreeding and hybridization of Indian material continued. Single crosses were effected among inbred lines from the USA; it should now be possible to produce seed of double-cross hybrids such as Dixie 18, Texas 26 and Georgia 281. Some intervarietal crosses offer a means of exploiting hybrid vigour, pending the development of hybrids between inbreds.

Pasture species. A scheme for breeding strains of grasses and legumes for northern India was initiated with investigations on *Cenchrus*, *Chrysopogon*, *Pennisetum* and *Pueraria*. Hot-water treatment (about 50° C.) for 4–9 minutes resulted in satisfactory emasculation.

Nicotiana. The high-yielding strains S–19 and S–20 of *N. rustica* were released.

Oil crops. Rust resistant NP strains of linseed were released. Promising early-maturing rust-resistant selections have been obtained from crosses of Bolley Golden and Afghanistan Z with NP rust-resistant strains. Some of the selections have displayed resistance to *Fusarium lini*. Progenies of crosses of the flax Wada with NP linseeds were further selected to develop early-maturing, rust-resistant dual-purpose strains.

Selection has resulted in improved fertility in autotetraploids of toria and linseed but not in those of sesame (cf. *PBA*, Vol. XXV, Abst. 1704).

Radish. Four different types of planting were tested for production of F_1 seed from intervarietal crosses: (1) parents in alternate rows; (2) alternate sowing of the two varieties in the same row; (3) zigzag arrangement of the parents in alternate rows; and (4) one variety surrounded in all directions by the other. The methods gave 49·8, 48·1, 85·5 and 93·8% of hybrids respectively.

Tomato. Sioux x Meeruti and Red Cloud x Meeruti have yielded valuable selections. Male-sterile lines obtained from the USA are being used in developing sterile lines of Sioux and Meeruti to facilitate the production of F_1 hybrid seed. The F_1 of Sioux x Meeruti outyielded the better parent, Sioux, by 23·6%.

Okra. F_1 hybrids of Sabour Selection x mosaic-tolerant varieties were selfed and back-crossed; the F_1's exhibited susceptibility to yellow vein mosaic. Round-fruited selections from Sabour Selection x Green Velvet, flowering earlier than the former parent, were crossed with mosaic-tolerant varieties. Heterosis for yield was expressed in some F_1 intervarietal combinations. Meiotic observations on the sterile F_1 hybrid *Hibiscus esculentus* ($n = 65$) x *H. tuberculatus* ($n = 29$) suggested that the former parent is an amphidiploid containing two genomes, with 36 and 29 chromosomes respectively, the latter complement being homologous with that of *H. tuberculatus*. The amphidiploid obtained by treating the F_1 hybrid with colchicine is to be used for the introduction of resistance to yellow vein mosaic from the wild species into okra.

Pigeon pea. The *Fusarium*-wilt resistant strain NPC15 Pusa was released for Bihar.

1021 VALDEYRON, G.
Rapport sur les travaux de recherche effectués en 1954. (**Report on research projects carried out in 1954**).
Ann. Serv. bot. Tunis 1953 : **26** : Suppl. Pp. 35.

The results of trials of indigenous and introduced varieties of cereals, flax, potato, leguminous crops, fruit trees and tomato are given. The

wheat variety Étoile de Choisy [Choisy Star] gave outstandingly high yields but its grain was poor in quality.

1022 Rapport annuel pour l'exercice 1954. **(Annual report for the financial year 1954).** Publ. Inst. nat. agron. Congo belge 1955 : Pp. 492.

In addition to the crops mentioned below, the results of variety trials and breeding work on *Pyrethrum*, *Urena lobata*, millet, sorghum, cassava, sweet potato and citrus fruits are given.

Maize. A number of synthetic lines have been developed at the Yangambi Research Station. Breeding for resistance to *Puccinia polysora*, *Sclerospora* spp. and *Helminthosporium* spp. is receiving priority.

Rice. Introductions from Indonesia, Madagascar and Argentina are under observation and numerous crosses are being undertaken. The grain quality and yield of the variety Vary Lava are being improved by selection.

Cotton. The results of trials at a number of centres in the northern areas of the Belgian Congo are given. Several new wilt-resistant lines have been developed.

Coffee. New species introduced from French Equatorial Africa, the Ivory Coast, Kivu and elsewhere include *Coffea stenophylla*, *C. kivuensis* and *C. eugenioides*. New varieties of *C. canephora*, *C. congensis* and *C. arabica* have also been introduced. In variety trials, the best results as regards yield and quality of the beans were obtained from SA158/139, E38/212, L36/115, L48/101, L93/18, L93/262 and L251/128. The results of investigations on self sterility in coffee are given. In the breeding programme crosses have been made between SA158, L36, L48, L93, L147, L215 and L251 to obtain hybrids combining high yield with vigorous growth. Cytological studies have shown that *C. arabica* has $2n = 44$, whereas *C. kivuensis*, *C. eugenioides* and *C. robusta* mut. *bullata* all have $2n = 22$. Attempts are being made to obtain tetraploid forms of *C. arabica* and *C. robusta* by colchicine treatment.

Cacao. The results of trials of young legitimate and illegitimate seedlings at the Nebanguma Centre are presented. The highest yields were obtained from F996. Selection for early maturity is being undertaken.

Oil palm. At the Yangambi Research Centre, investigations on the inheritance of the *albescens* character (cf. *PBA*. Vol. XXV, Abst. 799) have shown that it is determined by a single recessive factor. The *virescens* character is due to a single dominant factor influenced by modifiers. Cytogenetical studies of specimens of *Elaeis melanococca* obtained from Eala have confirmed that these palms are hybrids between *E. melanococca* and *E. guineensis* (cf. *PBA*, Vol. XXV, Abst. 799). Several crosses effected at Yangambi between *E. melanococca* and *E. guineensis* have proved highly productive, the best producer, No. 77, yielding 300 kg. in 1953 and 270 kg. in 1954. Studies on the mode of inheritance of productivity have shown that the progeny of distant crosses are more productive than the progeny of crosses from within the same family. Crosses between parents with the character "large number of bunches per tree" and "high weight of fruit per bunch" tend to be less satisfactory than crosses between two parents with a large number of bunches of medium weight. Introductions from Malaya, Indonesia and Senegal are undergoing trials.

Rubber. In clonal trials at Yangambi, Y3/46 combined high-yielding capacity with resistance to brown bast and damage by wind. Av163 and M8 proved superior as root stocks. In trials of three-year old seedlings, Tj1 gave the best results. Tj1, M8 and Tj16 proved of value as ♀ parents in interclonal crosses. The good latex properties of BD5 were successfully transmitted to the progeny of crosses with other clones. Cytological studies showed that *Hevea benthamiana* and *H. spruceana* both have $2n = 36$.

Orange. At the Mvuazi Research Station, varietal differences in susceptibility to different diseases, in particular *Colletotrichum gloeosporioides*, were noted. Selection of early-maturing varieties continues.

Groundnut. Experiments to determine the extent of natural hybridization were carried out; it was found to be between 0·6 and 1%. In variety trials, A20 and E4/2 gave the highest yields and had an oil content of 46–49%.

Coconut. Studies on the physiological and genetical causes of sterility phenomena in the coconut were carried out.

Banana. The dessert variety Km5 has been successfully crossed with *Musa acuminata* and a number of viable seeds have been obtained.

Soya bean. The results of trials at the Bambesa Agronomic Research Station are given. Breeding for earliness and high yield is continuing.

1023 **Annual Report of the Department of Agriculture, Colony and Protectorate of Kenya, for 1953. Vol. II—Record of Investigations.** 1955 : Pp. 205.

Cereals. Work on wheat was concentrated on selection of the numerous crosses made in

previous seasons. Two new races of stem rust have probably arisen (cf. Abst. 344).

Barley hybridization was initiated to combine the short straw and high yielding capacity of Scandinavian types with the drought resistance and wide adaptability of the Australian varieties Research and Prior.

The hybrid maize programme at Njoro suffered a serious setback owing to the exceptionally dry season. Progress in inbreeding and top crossing was achieved at Kitale. In cooperation with the East African Agriculture and Forestry Research Organization, a scheme was initiated at Kibarani on the Kenya coast during 1953 with the object of transferring resistance to *Puccinia polysora* from introduced lines to local varieties.

Pyrethrum. Clones are now being selected mainly from hybrids of known origin instead of from unselected bulks. In 11 trials, new crosses showed improvements in vigour and yield of pyrethrins over the first series of hybrids. Material undergoing seed multiplication included two of the new hybrids tested, viz. C43 (145 x P) and C51 (127 x 481). Wild and cultivated plants have been collected from the Dalmatian coast, the natural habitat of *Pyrethrum cinerariaefolium*, in the hope of securing sources of vigour and disease resistance.

1024 **Annual Report of the Department of Agriculture, Tanganyika, 1954** (1955) : Pt. II : Pp. 129.

Sorghum. SUK1, a segregate from BC27 x Wiru, combines earliness with weevil resistance and a Wiru type of grain and gives satisfactory yields; it is, however, susceptible to grain smut and bird damage. In breeding for resistance to weevil and grain mould, the F_4 of the back cross (BC27)2 x Wiru has shown promise. Early-maturing plants with the Msumbiji type of grain have been selected from the F_2 of (BC27)2 x Msumbiji and the best F_3 plants of this cross have been crossed with F_5 plants from (BC27)2 x Wiru. Early-maturing material with good grain has been selected from Dobbs 2 x Wiru. Goose-necked plants (cf. *PBA*, Vol. XXV, Abst. 1709) from crosses between (BC27)2 x Wiru and and early-maturing goose-necked Korgi and Ng'holongo hybrids continued to do well. The large glumes of Feki Mustahi are being transferred to early-maturing varieties. Large-glumed segregates from (BC27 x DD Shallu) x (BC27 x Wiru) are to be crossed with (BC27)2 x Wiru lines. Early strains with well-developed awns and short stiff panicle branches have been obtained from crosses and back crosses of BC27 with Nandayal Poona.

Cotton. Varietal trials continued at Ukiriguru. UK51 was equal to UK48 in yield and slightly superior in spinning quality, both varieties being higher yielding than MZ561. Further back crossing and selection for bacterial-blight resistance were carried out in crosses between Albar 51 and Ukiriguru strains (cf. *PBA*, Vol. XXV, Abst. 1225). The gene B_{6m} for blackarm resistance is being introduced into the best Ukiriguru lines. At Ilonga, 400 new selections for rain-fed conditions and 250 for irrigated conditions have been made.

Coffee. Good germination but considerable variation in vigour was found among the seeds resulting from crosses made in the 1952–53 season (cf. *PBA*, Vol. XXV, Abst. 1709).

1025 **Report of the Minister of Agriculture for Canada for the year ended March 31, 1955** : Pp. 166.

Puccinia. In *P. malvacearum*, *P. asteris* and *P. xanthii* $2n = 8$ (cf. *PBA*, Vol. XXV, Abst. 1711).

Growth chambers. Use of such chambers in which temperature, day length and other conditions are controlled has made possible the raising of several generations in a single year in breeding cereals and forage grasses and legumes. The growth chamber can also be employed in the production of polycrosses under conditions of perfect isolation, in interspecific crossing and in selecting for disease resistance.

Wheat. In spring wheat breeding for eastern Canada, lines of hybrid 5345 (McMurachy x Illinois 11 B8) showing outstandingly high resistance to leaf and stem rust have been crossed twice with Acadia to obtain satisfactory adaptability, earliness and yield. Resistant derivatives will be further crossed to various wheats with the purpose of consolidating resistance to rust races.

The new variety Lake was released (cf. *PBA*, Vol. XXIV, Abst. 2810).

Triticum durum 'DT136' and 'DT137' are being increased for possible release.

In work on soft winter wheat, tests of varietal reactions suggested that resistance to dwarf bunt is inherited in a simple manner. Hybrids between dwarf-bunt resistant varieties and standards are undergoing selection.

The use of monosomics in genetic studies of spring wheat was continued and also extended to winter types.

Varieties of *Triticum* spp. and hybrids from interspecific and intergeneric combinations were tested for sawfly resistance.

No relationship was found between carbohydrate content and sawfly resistance.

Buckwheat. Tokyo, a new variety of the smooth-hulled Japanese type, is to be released.

Oats. At the Central Experimental Farm, Ottawa, progress was made in breeding for resistance to diseases and lodging combined with larger seed size. Improvement in the rust resistance of Beaver has been achieved by back crossing. Transference of genes for disease resistance from the 2*n* species to cultivated varieties is being attempted. Genetical investigations on resistance to new races of rust were carried out at the Cereal Breeding Laboratory, Winnipeg. The Lacombe station, Alba., is concentrating upon back crossing to introduce earlier maturity into Eagle. Breeding for disease resistance and other improvements was continued at several other stations.

Barley. Vantmore and Wolfe were released (cf. *PBA*, Vol. XXIV, Absts. 2952–3). Tests of European two-rowed varieties are now in progress; it is hoped, in particular, that varieties suitable for irrigated conditions and with good malting quality will be found. The breeding programme in the Atlantic provinces has been considerably expanded; in Prince Edward Island jointworm resistance is receiving attention. Barley-like segregates with winter growth habit and resistance to certain diseases have been obtained from *Hordeum leporinum* ♀ x *H. vulgare*; intercrosses and back crosses to *H. vulgare* are under test for hardiness. Stocks homozygous for translocations were crossed with two varieties to secure information on the genetics of smut resistance.

Forage legumes. Selections of the red clovers Dollard, Ottawa and Siberian highly resistant to both northern anthracnose and powdery mildew are being subjected to progeny tests. Repeated selection for fertility in 4*n* red clover is giving encouraging results.

Progress has been made in breeding broad bean for resistance to diseases such as blight and anthracnose.

Potato. The results of a survey of races of *Phytophthora infestans* are summarized (cf. Abst. 1431).

Tobacco. Improved Briar (Green Briar x Kentucky 41) has been developed for the export trade. It is the first heavy-bodied burley variety possessing resistance to black root rot to compare favourably in quality with the susceptible standard Green Briar. New strains with lower nicotine content are under test. Hybrid mammoth strains are being bred.

Rape. The new variety Golden, developed at the Forage Crops Laboratory, Saskatoon, is superior to Argentine in seed yield and oil content.

Linseed. Raja was licensed (cf. *PBA*, Vol. XXV, Abst. 1711). Interspecific hybridization has been initiated in breeding for pasmo resistance.

Tree fruits. Four apple selections developed at Morden merit wider testing, viz. M–366 (Moscow Pear seedling x Melba), M–367 (Tetofsky seedling x Patricia), M–368 (Trial x McIntosh) and M–369 (open-pollinated seedling of Anisim). At Ottawa, 0–342 (Crimson x Melba) and T–441 [Crimson Beauty x Red Melba (late strain)], ripening at approximately the same time as Crimson Beauty, have shown promise, particularly as regards quality.

The cracking-resistant cherry Sue was released by the Summerland station, BC (cf. *PBA*, Vol. XXV, Abst. 2337).

Strawberry. Three seedlings have given a good performance in growers' tests: Agassiz 53 (Pathfinder x British Sovereign), F487 (Sparkle x Valentine) and F489 (Valentine x Sparkle).

Cucumber. The F_1 hybrid Morcrop (Mincu x New Cubit), suitable for both pickling and slicing, is ready for introduction (cf. Abst. 729). Another F_1 hybrid, Morden Early, six days earlier than Early Siberian, is also to be released.

Tomato. The early variety Harrow has been released, its chief advantage being resistance to fruit cracking.

Pea. A study of the nucleoli is in progress. Selkirk has shown wide adaptability in the Prairie region and is expected to complement Lincoln. Ottawa PE–1, by its late maturity, should prove capable of extending the season of production.

Abstracts of the Annual Meetings of the American Society of Agronomy, Davis, Calif. 1955 : Pp. 83. (Mimeographed).

1026 *Lang, A. L. & Pendleton, J. W. The response of hybrid corn varieties to planting rates and nitrogen fertility levels.* (*pp. 29–30*).

At Urbana, Illinois, six single-cross hybrids differed significantly in yield response to different levels of nitrogen supply and to different densities of planting; variation occurred chiefly in the number of ears per 100 plants.

1027 *Brown, J. W. & Hayward, H. E. Salt tolerance of alfalfa varieties.* (*p. 45*).

Of six varieties grown for three years in plots irrigated with water containing 0, 3000, 6000 and 9000 ppm. of a 50 : 50 mixture of sodium and calcium chlorides, California Common and

India gave the highest yields at the 0 and 3000 ppm. levels and Turkestan and Atlantic at the 6000 ppm. level; no significant varietal differences were observed at the highest level of salt concentration.

1028 *Ausemus, E. R., Hsu, K. J. & Sunderman, D. W. Resistance to stem rust race 15_B induced by ionizing radiation in wheat.* (*p. 48*).

Three lots of seeds of the hard red spring wheat Lee 549, which is susceptible to stem-rust race 15B, were exposed, respectively, to (1) X rays at 16,000 r, (2) X rays at 12,000 r and (3) thermal neutrons at approximately $4{\cdot}6 \times 10^8 N_{th}/cm.^2/sec$. Two of the X_2 progenies from treatment (1) each comprised susceptible and moderately resistant plants; one of those from treatment (2) contained moderately resistant plants only; and one of the second generation progenies from treatment (3) included susceptible and resistant plants. The frequency of induced changes was 0·46% for treatments (1) and (3) and 0·1% for treatment (2). All the resistant plants appeared to be identical with the control in agronomic characters.

1029 *Bennett, H. W. A sorgo x Johnsongrass species hybrid, segregates, and certain backcrosses.* (*p. 48*).

The F_1 generation of the cross between *Sorghum vulgare* 'Hodo' ($n = 10$) ♀ and *S. halepense* ($n = 20$) ♂ showed regular meiosis ($2n = 40$) and was 85% fertile. Among the F_2 progeny, which was highly variable in plant height, number of culms per plant, colour of the glumes and size and spread of the rhizome, 16·5% of the plants were annual and 6·5% biennial. Meiotic abnormalities were observed in a number of segregates. Back crossing to another variety of *S. vulgare* resulted in the production of a triploid with 30 chromosomes showing irregular behaviour at prophase.

1030 *Carnahan, H. L. & Brown, K. G. Quantitative inheritance in* Trifolium repens. (*p. 48*).

Data from a cross between a large-leaved Ladino clover clone and a small-leaved white clover gave inconclusive evidence regarding the number of factors governing leaflet width and leaflet length, but indicated that the two characters were correlated.

1031 *Clary, G. B. & Nelson, O. E. (Jun.) The inheritance of expansion in popcorn.* (*p. 48*).

Linkage between the locus *P* for cob colour and factors influencing expansibility was found in Supergold 18 and Baby Golden 1708 but not in South American 24 or Hulless 1001. The Supergold inbreds 18, 1533, 67 and 4191 differed in the number and position of factors affecting expansibility.

1032 *Coleman, O. H. & Stokes, I. E. The inheritance of weak stalk in sorgo.* (*p. 49*).

In the cross Sart x Iceberg the erect stalk of the former parent was dominant over the weak stalk of the latter. The gene pair involved, *Ee*, was inherited independently of the factors for resistance to anthracnose (*Ll*) and to stalk red rot (*Lsls*).

1033 *Dudley, J. W. & Wilsie, C. P. Inheritance of paniculate inflorescence and an abnormal flower character in* Medicago sativa. (*p. 49*).

From data on the F_2 and back-cross progenies of a cross between a normal plant and one with a paniculate inflorescence and abnormal flowers, it is concluded that a normal inflorescence and normal flower structure are each determined by two complementary dominant genes, one of which is inherited in a disomic and the other in a tetrasomic manner.

1034 *ElBanna, A. & Johnson, I. J. Effectiveness of successive cycles of recurrent selection in sweetclover.* (*p. 49*).

At Iowa State College, recurrent selection was effective for growth habit but not for plant vigour, the heritability of the former character being high and that of the latter low.

1035 *Elliott, F. C. Progress in translocating* Agropyron *bunt resistance to hexaploid wheats through radiation techniques.* (*p. 50*).

The number of chromosomes conditioning the high bunt resistance found in wheat x *Agropyron elongatum* hybrids ($2n = 56$) at Washington State College has been determined. Attempts are being made to translocate the resistance, which is carried on the *Agropyron* chromosomes, into the 42-chromosome complement of the wheat. The efficacy of X rays, P^{32}, S^{35} and thermal neutrons in inducing such translocations is being investigated.

1036 *Finkner, R. E. & Swink, J. F. Breeding for resistance to the sugar beet nematode* Heterodera schachtii. (*p. 50*).

An association has been found between tolerance of nematodes and low content of galactinol; the lowest-yielding selection contained four times as much galactinol as the highest-yielding. It is suggested that resistant material may be obtained by hybridization of cultivated beet

with immune wild species or by irradiation of seed.

1037 *Harvey, P. H. & Thompson, D. L. Cycle evaluation of recurrent selection for grain in corn.* (*p. 50*).

At North Carolina State College, the S_1 maize progenies from two cycles of divergent recurrent selection for high and low grain yield differed widely both in yield and in performance in test crosses; however, crossing within the respective high-yielding and low-yielding groups eliminated most of the differences between the groups. After the third and fourth cycles the means of the two populations tended to differ. Individual inbred lines from the S_1 of each cycle of selection for high yield have outyielded the hybrid control, NC27.

1038 *Hockett, E. A. The inheritance of branching in sunflowers.* (*pp. 50–51*).

From data on crosses between an unbranched form and plants showing various types of branching, it is concluded that branching at the top of the stem is determined by a single dominant gene and that branching over the whole stem without formation of a central head is governed by two dominant duplicate genes. One of the latter is linked with an allele which, in the recessive condition, is responsible for chlorosis of the growing point in the unbranched parent; data from the F_2 and back-cross progenies gave crossing-over values of 11·4 $\pm$ 3·8% and 12·1 $\pm$ 9·1%, respectively.

1039 *Hsu, K. J., Sunderman, D. W. & Ausemus, E. R. Dwarf plants resulting from crossing different varieties of wheat.* (*p. 51*).

From the F_2 segregation ratios occurring in crosses between the spring wheats Kenya 338 AC2E2, Timstein, (Na 101 x Timstein) x Mayo, Frontana and Marquis it is postulated that the dwarf habit is in each case determined by the interaction of two of four factors, *A*, *B*, *C* and *D*, interactions between *A* and *C*, *A* and *D* and *B* and *D* resulting in the dwarf habit and between *A* and *B*, *B* and *C* and *C* and *D* giving normal plants. The varieties have been assigned the following genotypes: K338 AC2E2, *AAbbccdd*; Timstein, *aaBBccdd*; (Na 101 x Timstein) x Mayo, *aabbCCdd*; and Frontana and Marquis, *aabbccDD*. It is suggested that the four factors may have originated from three different genomes, two of them, which together do not produce the dwarf habit, belonging to the same genome.

1040 *Jones, C. M. & Rossman, E. C. Inheritance studies of corn maturity.* (*p. 51*).

Among six crosses between early and late maize inbreds, early maturity was dominant or partially dominant over late maturity, with some hybrids showing heterosis for earliness. Some inbreds appeared to carry dominant genes for early silking which were without effect on the moisture content of the ear, while others were late in silking but possessed dominant factors for rapid drying of the ear. Average heritability was greater for ear moisture content than for silking data. The variances of the back crosses to the early inbred often tended to be lower than those of the F_1.

1041 *Knowles, P. F., Houston, B. R. & McOnie, J. B. Inheritance of resistance to* Fusarium *wilt in the flax variety Punjab 53.* (*p. 52*).

The resistance of Dakota Sel. 48–94 and of Punjab 53, a composite of a number of selections from a single plant of Punjab (CI20), to the wilt clones 294 and 287 was determined by two complementary factors Fu_A and Fu_B. The resistance of Dakota Sel. 48–94 to the wilt clone 33–1, to which Punjab 53 is susceptible, appeared to be controlled by a third gene Fu_C.

1042 *Konzak, C. F.* Helminthosporium victoriae *blight resistance in oats induced by ionizing radiations.* (*p. 52*).

In experiments with the variety Tama, irradiation of seeds with thermal neutrons at $2 \times 10^{13} N_{th}/cm^2$ resulted in a mutation frequency of about 2% for blight resistance; the mutations arose mainly as sectorial chimeras. Blight resistance, which in one mutant seemed to be inherited as a recessive factor, appears to be closely linked with susceptibility to crown rust but two blight-resistant seedlings with some crown rust resistance have been obtained.

1043 *Koo, F. K. S. & Myers, W. M. Induction of resistance and susceptibility in oats to rusts by ionizing radiations.* (*p. 52*).

At the University of Minnesota, plants resistant to stem rust races 7 and 8 have been obtained by irradiating (1) seeds of Ajax and Clintafe with $9{\cdot}94 \times 10^{12} N_{th}/cm^2$ and (2) two lots of seed of [Landhafer x (Mindo x Hajira-Joanette)] x Andrew with $1{\cdot}20 \times 10^{13} N_{th}/cm^2$ and X rays at 12,000 r, respectively. Some third-generation progenies from treated Ajax and Clintafe bred true for resistance to both races, while others were homozygous for resistance to one and segregated for resistance to the other.

1044 *Leffel, R. C., Weiss, M. G. & Johnson, H. W. Effectiveness of recurrent and pedigree selection for increased oil content of seed in a soybean cross, Adams x Hawkeye.* (*p. 52*).

The two methods of selection for oil content appeared to be equally effective in this cross.

1045 *Lowe, C. C. Evaluation of variance components from forage crop yield trials.* (*p. 53*).

Values for genetic advance, computed from the variance components obtained from 53 forage crop yield trials conducted in New York State during 1946–51, indicate that, for grasses, optimum conditions of selection for yield involve 3–4 replications and two years of harvesting; for legumes, 6–8 replications would be required. Genetic variation is said to have been smaller among grass strains overseeded with a legume than among grasses tested alone.

1046 *Mode, C. J. & Schaller, C. W. The inheritance of resistance to net blotch,* Helminthosporium teres, *in certain barley crosses.* (*p. 53*).

Resistance was conditioned by duplicate genes in CI2750 and CI4922 and by a single gene in CI4797. Preliminary data from crosses among these and CI4407–1, in which resistance was already known to be monogenically determined, suggest that at least four loci are involved in controlling net-blotch reaction.

1047 *McAllister, D. R. & Davis, W. H. Detection of coumarin in seeds of* Melilotus. (*p. 53*).

A technique is described for detecting coumarin in seeds of *Melilotus* without destroying their viability.

1048 *McMichael, S. C. Breeding for gossypol removal in cotton seed.* (*p. 53*).

A mutant with hypocotyl, stems, petioles and bolls all lacking the glands which contain gossypol and a second mutant with eglandular leaves but glandular cotyledons have been found. Selection for reduced gland number in the cotyledons is in progress.

1049 *Owen, C. R. Genetic variability in Dallis grass for seed quality.* (*p. 54*).

A heritable variation in seed viability has been found in clones of *Paspalum dilatatum* at Louisiana State University; selection for seed quality is proving effective.

1050 *Pickett, R. C. Variation in percent dry matter, leaves, protein, yield and other characteristics in certain sudangrass varieties.* (*p. 54*).

Varietal differences in yield of dry matter at first cutting, percentage of dry matter, leaf yield, response to thinning and percentage of protein are noted for the early varieties Piper and Wheeler and the later varieties Greenleaf and Lahoma, tested at Manhattan, Kansas.

1051 *Poole, D. D. The accuracy of castorbean hulling percentages.* (*p. 54*).

A single one-pound sample from each replication of a variety test, hulled with a small hand operated machine, was sufficient for estimating the hulling percentage with a fair degree of accuracy.

1052 *Roberts, L. M., Grant, U. J., Mangelsdorf, P. C. & Smith, D. L. Classification of the races of maize of Colombia.* (*p. 55*).

Among 2000 maize collections made in Colombia, 16 races have been identified with certainty; there appear also to be four or five other races. It is suggested that, although Colombia may not be the centre of origin, it is probably a centre of domestication and possibly a centre of introgression of *Tripsacum* genes. Several groups of genes affecting the colour of various organs and tissues have been observed but have not been genetically analysed. The collections include valuable breeding material, much of which appears to be of recent hybrid origin.

1053 *Sears, E. R. An intergeneric gene transfer induced by X-rays.* (*p. 55*).

Plants with 21 wheat chromosomes and an additional isochromosome of *Aegilops umbellulata* carrying high leaf-rust resistance were X-irradiated prior to meiosis and were subsequently used to pollinate normal untreated plants. Numerous susceptible and resistant plants were produced, 50 of the latter having translocations involving the *Aegilops* chromosome. A few of the translocations were transmitted by the pollen to the progeny at rates of 27–43%, suggesting that in these cases intercalations of small segments of the *Aegilops* chromosome into wheat chromosomes were involved; in other cases reciprocal translocations of large sections occurred, with deleterious effects on pollen performance and plant characters. The individual with the highest rate of transmitting translocations to the progeny showed regular chromosome pairing and normal plant characters and was nearly immune from all the 22 races of leaf rust with which it was tested.

1054 *Stanford, E. H. & Clement, W. M. A haploid plant of* Medicago sativa. (*p. 55*).

A self-sterile haploid ($n = 16$) set fruit on 50% of the florets pollinated with pollen from normal tetraploids but only on 5% of those pollinated

with pollen from diploid races of *M. sativa* or *M. falcata*. Pollen production by the haploid was poor but a few pods set when it was used as male parent in crosses with tetraploids. The progeny from crosses with diploids bore 16 chromosomes; crosses with tetraploids produced plants falling into one of three groups with 24, 31–33 or 39–40 chromosomes. Eight bivalents per cell occurred in 43% of the haploid metaphase cells and a few bridges were seen at anaphase. It is considered that at least two translocations and one inversion have occurred in the chromosome complement.

1055 *Van Horn, D. L. & Zimmerman, L. H. Percent oil as a criterion in castorbean breeding.* (*pp. 55–56*).

A reliable method of estimating the oil content of the seed has been devised, by means of which appreciable differences between strains have been detected.

1056 *Vogel, O. A., Craddock, J. C.* (*Jun.*), *Muir, C. E., Everson, E. H. & Rohde, C. R. Semi-dwarf growth habit in winter wheat for the Pacific northwest.* (*p. 56*).

In eastern Washington and at Pendleton, Ore., semidwarf selections from Norin [Ministry of Agriculture and Forestry] 10 x Brevor were generally superior to commercial varieties and showed the following desirable characters: greatly reduced plant height; reduced straw tonnage; very high resistance to lodging; higher grain yields under conditions particularly favourable to vegetative growth; and lower straw : grain ratios. The highest-yielding semidwarf lines had the lowest protein contents, but their total protein yields nevertheless usually exceeded those of the highest-yielding commercial varieties. Most of the semidwarf selections were partially male sterile, but two reselections, 14 and 17, were nearly normal in flowering habit.

1057 *Woodward, R. W. Factor interaction producing a 9 : 3 : 4 ratio for hoods and awns in barley.* (*p. 56*).

The F_2 of a cross between a short-awned barley and a normal, hooded, two-rowed variety segregated in the ratio 9 hooded : 7 awned, the awned plants falling into two classes with short and long awns respectively. Arrangement of the kernels in opposite pairs was determined by a single recessive factor.

1058 *Zimmerman, L. H. A dwarf-internode gene for reducing plant height in castorbeans.* (*p. 56*).

A factor for dwarf internodes was found to be inherited independently of the nodal characters of the raceme, total number of nodes, dehiscence of the capsule and sexual characters.

1059 *Burton, G. W. Forage plant breeding—today and tomorrow.* (*p. 57*).

Current breeding objectives and methods are outlined and the view is expressed that techniques involving intraspecific hybridization, back crossing, recurrent selection and the use of heterosis are likely to become of increasing importance in the future.

1060 *Harlan, J. R. New sources of old germ plasm.* (*p. 57*).

The desirability of exploring the centres of variation of forage grasses and legumes with the aim of finding valuable sources of breeding material is stressed.

1061 *Rodger, J. B. A., Williams, G. G. & Davis, R. L. A rapid laboratory procedure for determining winter hardiness in alfalfa.* (*p. 72*).

When germinated in a series of salt solutions of increasing osmotic pressure, seeds of hardy varieties showed less reduction in rate and percentage of germination than those of non-hardy varieties.

1062 *Hovin, A. & Stoutemyer, V. T. Variability in* Poa annua. (*p. 74*).

Variation among populations has been observed in habit, time of flowering, temperature and light requirements, coloration and inflorescence characters.

1063 **Forward together. Annual Report of the North Carolina Agricultural Experiment Station 1954**: Pp. 39.

Potato. The late-blight resistant varieties Boone and Plymouth have been released for the mountainous and coastal-plain regions respectively. Plymouth also has some resistance to common scab.

Cotton. The best methods of using wild species to improve commercial types are being determined.

Groundnut. The high-yielding varieties NC–1 and NC–2 have been released, the latter being resistant to southern stem rot (cf. *PBA*, Vol. XXV, Abst. 3384). Varieties are also being developed by inducing mutants by radiation.

Blueberry. The canker-resistant varieties Angola, Croatan, Murphy and Wolcote have been introduced.

1064 **Research Progress at the Illinois Agricultural Experiment Station. Report for 1952-1954** (1955) : Pp. 135.

Maize. The feasibility of producing hybrids

containing 6% or more oil without sacrifice in yield and other desirable characters has been demonstrated. Protein content has also been increased by breeding. By back crossing, the Kys type of male sterility has been incorporated in inbreds. A large-scale project of maintenance of genetic stocks was initiated; the material is to be made generally available to those engaged in maize research.

Pinus. *P. rigida* x *P. taeda* showed vigour, good form and greater hardiness than *P. echinata* or *P. taeda* in southern Illinois. *P. echinata* x *P. rigida* gave a poor performance.

Raspberry. The release of Purple Autumn is mentioned (cf. *PBA*, Vol. XXIV, Abst. 1438).

Strawberry. Plentiful, a sister of Vermilion, was released.

The following theses are of interest to plant breeders:—

1065 *Metzger, R. J. Induced autopolyploidy in red clover,* T. pratense *L. and crimson clover,* T. incarnatum *L.* (*Abst.*). (*p. 37*).

Colchicine-induced tetraploids of the above species were of no immediate agronomic value. Differences observed in several characters suggested that selection of desirable types might however be possible.

1066 *Taylor, A. R. Some morphological adjustments made by certain corn hybrids when grown in the same and separate hills at various populations.* (*Abst.*). (*p. 38*).

Evidence was obtained suggesting that it may be possible to produce maize hybrids capable of maintaining high yields at high planting rates by selecting inbreds with the ability to reduce height under competitive conditions and to convert stem elongation into ear production.

1067 *Fields, R. G. Seedling morphology and anatomy of a new dwarf mutant in maize.* (*Abst.*). (*p. 39*).

Compared with seedlings of normal maize, those of the mutant "W8 dwarf" were retarded in leaf-sheath and stem elongation, apparently as the result of a slower rate of cell division in secondary meristems. The mutant depended upon a single recessive gene.

1068 *Barrett, H. C. Black-rot resistance in grapes.* (*Abst.*). (*p. 104*).

Few, if any, of the F_1 hybrids involving commercial types showed marked resistance to black rot (*Guignardia bidwellii*); several wild selections were highly resistant. F_1 data suggested quantitative inheritance of resistance.

1069 *Sasaki, P. J. Studies on resistance in certain tomato varieties to damping-off caused by* Pythium debaryanum. (*Abst.*). (*p. 106*).

Bonny Best and Indiana Baltimore, both highly susceptible to *Fusarium* wilt, were also highly susceptible to *P. debaryanum.* Rutgers, with intermediate resistance to *Fusarium,* was moderately susceptible to damping-off. Southland, Pan America and Illinois 97A, generally immune from race 1 of wilt, proved to be highly resistant to *P. debaryanum.*

1070 **Your division of agriculture reports. A report of the division of agriculture of the Iowa State College, Ames, Iowa, for the year July 1, 1954 to June 30, 1955.** Pp. 65.

Maize. Work on hybrid production continued.

Barley. Hybrid derivatives were selected for smut resistance. An attempt is being made to combine the earliness and resistance to stem rust and head blight shown by CI9539 with the stiffer straw, plumper kernels and higher yield of other parents.

Potato. The scab-resistant variety Osage was released. On the average it has produced a higher total yield and higher percentage of US No. 1 tubers than Cobbler in tests for six years. Its cooking quality is good. The variety is susceptible to hollow heart under certain conditions.

Apple. The fire-blight-resistant seedling A611 (Jonathan x Delicious) is to be named and released (cf. *PBA*, XXV, 2320). Its fruits are similar to those of Jonathan in form but are improved in colour. They can be kept until April and have so far shown no defects in storage.

Raspberry. The red raspberry crosses Latham x Washington and Latham x NC 206 have given outstandingly good results. Nonsuckering types have been selected from the latter cross. The high-yielding black raspberry seedling 77 is being propagated prior to its introduction.

Onion. The following hybrids were released in cooperation with other stations and the US Department of Agriculture: Abundance, Elite, Champion, Encore, Contender, Bonanza, Epoch, Surprise and Aristocrat (cf. *PBA*, Vol. XXV, 592). The first five are adapted where Early Yellow Globe is now grown and they equal or surpass this variety in storage quality. The remaining four are better than Brigham Yellow Globe and related strains in keeping quality. All nine hybrids surpass open-pollinated varieties of the same type in such characters as uniformity, colour and scale retention.

Breeding for pink-root resistance in storage onions is in progress. Canary-yellow bulb colour is being investigated genetically.

Pumpkin. Cangold, a selection of Kentucky Field, was released.

Tomato. Selection for intensity of fruit colour by means of chemical and visual tests continued. Transference of a morphological type of sterility to suitable lines is in progress.

Lima bean. Small-seeded types were much more resistant to heat and drought than large-seeded. High-yielding selections of the former are to be used in breeding.

Soya bean. Several hybrid strains show possibilities for release as new varieties.

Crops and soils field day report.
Circ. Kans. agric. Exp. Sta. 1955 : No. 323: Pp. 35.

1071 *Clapp, A. L. Kansas corn performance tests.* (*pp. 8–10*).
The results of recent trials of maize hybrids are discussed.

1072 *Fellows, H. & Sill, W. H.* (*Jun.*) *Wheat mosaic investigations.* (*pp. 10–11*).
Development of varieties resistant to soil-borne mosaic and mite-carried streak mosaic is in progress. Concho and Comanche are highly resistant to the former.

1073 *Grandfield, C. O. Alfalfa investigations.* (*pp. 11–13*).
Tests of rhizomatous and creeping types are reported.

1074 *Hansing, E. D. Cereal smuts and their control.* (*p. 14*).
Work has been carried out on races of smuts of wheat and oats and on the reactions of varieties and advanced hybrid selections.

1075 *Heyne, E. G. & Casady, A. J. Cereal breeding.* (*pp.14 –16*).
Winter wheat. Concho (cf. *PBA*, Vol. XXIV, Abst. 1023) and CI12518, a sister strain of Kiowa, have been approved for distribution. Concho has the advantage of resistance to bunt. leaf rust and soil-borne mosaic and tolerance of streak mosaic, but the disadvantages of susceptibility to stem rust and Hessian fly, poor hardiness and tendency to lodge. CI12518 is similar to Kiowa except that its flour has the desirable character of requiring longer mixing time.

Spring oats. Breeding to incorporate resistance to crown and stem rusts, smut and Victoria blight in stiff-strawed varieties is in progress.

Winter barley. Selections resulting from breeding at Manhattan and Hays have so far shown greater winter hardiness than Reno.

Sorghum. Breeding is concentrated on hybrid production; male-sterile lines are being developed for use as seed parents and inbreds are being tested for combining ability.

Progress has been made in combining resistance to kernel smut with good agronomic features. Transference of aphid resistance to grain and forage types is being attempted.

1076 *Johnston, C. O. & Haskett, W. C. Cereal rust investigations.* (*pp. 17–18*).
Many selections of wheat with leaf-rust resistance derived from South American sources are at an advanced stage. Lines with resistance to stem rust derived from Kenya wheats and wheat x *Agropyron* crosses have been developed. Oat breeding for rust resistance is also in progress.

1077 *Mader, E. L. Soybean investigations.* (*pp. 24–25*).
The results of varietal trials in eastern Kansas are summarized.

1078 *Pickett, R. C. Pasture grass breeding.* (*pp. 25–27*).
Work on *Bromus inermis, Phalaris arundinacea, Panicum virgatum, Andropogon hallii, Sorghastrum nutans* and other species is outlined.

1079 *Tatum, L. A. Corn breeding.* (*pp.* 32–34).
Strain mixtures, synthetic varieties and complex hybrids offer possible means of obtaining wider adaptation in maize. Some complex hybrids (double x double and double x single crosses) have given average yields equal to those of standards.

Popcorn hybrids showing improvement in several characters are under test.

Fall field day report of the Fort Hays Branch Station, Hays, Kansas, for 1954-55.
Circ. Kans. agric. Exp. Sta. 1955 : No. 330 : Pp. 24.

1080 *Ross, W. M. & Miller, J. D. Cereal crops.* (*pp. 4–7*).
Breeding and variety testing of wheat, oats, barley and sorghum are briefly reported. The production of F_1 hybrids with the aid of male sterility is under way.

1081 *Bellingham, R. C. Wheat streak-mosaic.* (*pp. 7–8*).
No wheats immune from streak mosaic have so far been found. Kiowa and Triumph have shown more tolerance than other recommended varieties in the Hays area.

1082 *Hackerott, H. L. Forage crops.* (*pp. 19–21*).

It is mentioned that selection of improved forage types of *Agropyron smithii* and development of more reliable seed-producing strains of this grass are in progress.

1083 Wellhausen, E. J.
El estado actual de los trabajos sobre mejoramiento genético de las principales plantas básicas alimenticias, en la América Latina. (**The present state of the work on genetical improvement of the main basic food plants in Latin America**).
Agricultura trop. 1955 : **11** : 661–71.

A general outline is given of present activities, reference being made particularly to the schemes for collecting and maintaining the local maize varieties of all Latin American countries; banks of germ plasm have been established in Mexico, Colombia and Brazil and over 8000 lines are now available. Some of the varieties collected at high altitudes give yields of 4 to 5 tons per hectare and are considered very promising for breeding purposes. Yield increases varying from 16 to 66% have been achieved by introducing the best South American varieties into different countries of Central America; Venezuela 1, selected from a varietal mixture introduced from Cuba, has given increases of 100% in Venezuela and good results in Argentina and elsewhere. Hybrid maize is effecting improvements in several countries and in Mexico advanced-generation synthetic hybrids are now yielding up to 90% as much as the hybrids.
Extensive collections of local forms of *Phaseolus* species have been made and selections from certain Mexican varieties have yielded 2000 to 2500 kg. of beans per ha.; the most productive is a black bean which is also very disease resistant and extremely valuable for breeding. The Interamerican wheat-rust programme is giving useful results in increasing the genetic diversity of the wheat varieties now being bred and so reducing the risks of epidemics: Mexican varieties now comprise a mixture of 10 or more lines differing in disease resistance and yields of up to 4 or even 5 tons per hectare are being obtained; the Mexican varieties Menkemen and Bonza are giving good results in Colombia and one of the new Colombian varieties is doing well in Mexico. The Mexican potato *Solanum pinnatisectum* is resistant to *Phytophthora infestans* and this and other species are being used in a programme of breeding potatoes resistant to the very virulent Mexican strains of this fungus.
The author emphasizes the necessity of improving soil conditions side by side with improvements of varieties.

1084 **Twenty-ninth Annual Report of the Department of Scientific and Industrial Research, New Zealand, 1955** : Pp. 76.

The section entitled Research, giving a general account of some of the main results of work during the year under review, includes the following items of interest to plant breeders:—
Wheat. Arawa (line 393), a nonshattering variety resistant to lodging and suitable for direct heading, is to be released as a substitute for Dreadnought (cf. *PBA*, Vol. XXV, Abst. 873).
Potato. Advanced hybrid selections, some of which are resistant to one or more strains of late blight, are under extensive trial.
Hops. Breeding has been initiated to develop a variety to replace the one grown commercially at present which is highly susceptible to *Phytophthora*.
Vegetables. The table carrot Sweet Crop, developed from the fodder variety Holmes Improved by selection for smaller size and desirable shape, was released. An early maturing strain of the savoy cabbage Best of All has also been distributed; it is noteworthy for its high percentage of marketable heads and uniformity in time of ripening.

1085 **Sixth Annual Report of the Commonwealth Scientific and Industrial Research Organization for the year ending 30th June, 1954: Canberra, Australia :** Pp. 179.

Pasture plants. Work was begun on the project, sponsored jointly by FAO and the above organization, to collect pasture and fodder species in north Africa and the Mediterranean region (cf. *PBA*, Vol. XXIV, Abst. 3027). Survey visits were made to Libya, Algeria and Morocco.
As a preliminary to interspecific hybridization, chromosome numbers are being determined in the following genera: *Stipa, Danthonia, Triodia, Hordeum, Cenchrus* and *Chloris*. Crossing between *H. bulbosum* and *H. vulgare* is being attempted in the hope of producing a type of *H. bulbosum* with more desirable awn characters. Allotetraploids ($2n = 42$) of *Phalaris caerulescens* x *Ph. minor* are annuals. Allohexaploids ($2n = 56$) from *Ph. tuberosa* x *Ph. minor* are promising perennials with early vigorous growth; bulk selections of segregates are being allowed to intercross naturally to build up seed supplies.

Australian ecotypes of lucerne are being studied. *Medicago tribuloides* '173', a highly productive strain, is to be released by the NSW Department of Agriculture.

A world survey of white clover showed that the frequencies of the genes for lotoaustralin and linamarase are related to winter temperature. Altitudinal populations in Australia are now being subjected to a similar survey.

Hybridization of *Trifolium subterraneum* is more successful under cool, humid conditions. In the improved technique developed, emasculation is effected by removing the folded corollas with the attached stamens at the early bud stage; the stigmas are then pollinated on several successive days. The best agronomic types have been obtained from Tallarook x Dwalganup, Tallarook x Northam First Early, Mount Barker x Dwalganup and Mount Barker x Northam First Early. Some F_2 segregates combined vigour and density with early flowering.

When inoculated with *Phaseolus* virus 2, a mosaic disease found in the Canberra area and elsewhere, the majority of varieties became mottled. Northam First Early, Dwalganup and Pink Flowered, however, developed lethal necrosis and were highly field resistant. Crosses between mottle-reacting varieties yielded F_2 progenies showing mottling; the F_2 of crosses between a mottling parent and one developing lethal necrosis contained a preponderance of plants with the latter type of reaction. A quarter of the F_2 progeny of Tallarook x Northam First Early were highly resistant to the virus when hand-inoculated.

Investigations are to be carried out on the response of hybrid populations of subterranean clover to artificial and natural selection. Many of the natural environments to be used will be marginal for the species so as to encourage selection of adaptive types.

Only in Dwalganup was dry-matter production increased by tetraploidy, the increase being 60 and 65·5% at flowering and maturity respectively. In all varieties, tetraploids resulted in reduced seed setting, but in Dwalganup seed yield per plant was unaffected, owing to the increased number of flowers.

Strains and individual plants of subterranean clover vary in symbiotic effectiveness and in the number and disposition of the root nodules. Without exception, $4n$ forms nodulated more sparsely than their $2n$ counterparts.

Investigations were initiated on the genetics of grass and leguminous species in connexion with the development of improved types for coastal and subcoastal Queensland. Special techniques are being investigated to overcome the problem of apomixis in breeding *Paspalum* and *Panicum*. Mode of pollination is being studied in *Phaseolus* spp., *Stylosanthes gracilis*, *Leucaena glauca*, *Desmodium* spp. and *Indigofera* spp.

Flax. Breeding for rust resistance continued.

Tobacco. Lines with the necrotic kind of resistance to mosaic are being grown to select agronomic types suitable for northern Queensland. Since such resistance breaks down at high temperatures, particularly above 97° F., crosses have been made with Ambalema. Controlled by a recessive factor, resistance in this variety is associated with slow multiplication and spread of the virus, followed by inactivation.

Plants resistant to looper caterpillar are being selected in the F_1 of a cross in which Maryland Mammoth was the unpalatable parent. The F_1 was palatable.

Of the 14 *Nicotiana* spp. tested for susceptibility to yellow dwarf virus, 5 failed to develop symptoms. *N. glauca*, a symptomless carrier of yellow dwarf, big bud and mosaic viruses, was crossed with *N. tabacum* to elucidate this reaction.

Oil crops. Safflower breeding continued at the Waite Agricultural Research Institute, Adelaide, and elsewhere. A variety yielding edible oil has been crossed to improve its agronomic properties.

Linseed selections from Punjab x Walsh displayed superiority in oil content and yield per acre to Walsh.

Castor-bean selections with resistance to shattering and uniform maturity were obtained.

1086 **Report of the Waite Agricultural Research Institute, South Australia, and associated activities of the Commonwealth Scientific and Industrial Research Organization 1952-1953** : Pp. 70.

Neurospora. Pseudowild types occurring in crosses of pseudoallelic pyridoxineless mutants probably arose through chromosomal aberrations.

Wheat. Gabo x 3 Dirk (726) again proved superior to Dirk in yield trials; it is considered worthy of naming and release. Four new bunt-resistant hybrids compared favourably with their susceptible prototypes. Their resistance, derived from the tetraploid wheat Doubbi and dependent upon a recessive gene, was effective against all Australian races of *Tilletia caries* and *T. foetida*. Transference of the gene in Kenya C6041 for leaf-rust resistance to ten leading South Australian wheats was completed, five

successive back crosses having been carried out.
Maize. The "residual genotype" influenced nondisjunction of interchanged B chromosomes and preferential fertilization. Investigation of 4*n* stocks is in progress.
Phalaris. Chromosome numbers of all species of the genus have been counted. Study of two interspecific hybrids (not specified) disclosed a new type of abnormal behaviour of univalents and a way in which variation may arise. The breeding system of self-sterile *Ph. aquatica* was analysed by observing pollen germination and growth on styles; genetical analysis revealed "an entirely new system of compatibility control which may be widespread amongst the grasses".
Danthonia. Chromosome numbers of native species were determined. The relationship between stomatal size and chromosome number was studied. *D. caespitosa* consists of types with $2n = 24$, 48 or 72 chromosomes.
Medicago. In nearly all crosses involving seven variants of *M. tribuloides*, the F_1 exhibited considerable hybrid vigour. Male sterility, direction of pod coiling, presence of spines on the pod and anthocyanin production were each simply inherited, whereas the particular nature of the spines on the pod and anthocyanin pattern of the leaf appeared to be inherited in a complex manner. In line CSIRO Mtrb 173, complementary genes for albino seedlings were present. In crosses between early and late flowering strains some F_2 lines were earlier than the first flowering parent.
Flax. A rust-resistant derivative of Norfolk Earl was named Ventnor; it gives good yields of straw with fibre of high quality. Seventeen genes conferring immunity or some degree of resistance to one or both of the Australian stocks of rust studied have been identified. They are situated at not less than four and not more than eight loci.
Linseed. Selections of Punjab x Walsh showed promise.
Safflower. The inheritance of agronomic characters was investigated. New varieties were released for yield trials. Seed stocks of a spineless selection with an oil content ranging from 28 to 38% were multiplied.

1087 "Weibullsholm", Zweeds Instituut voor Plantenveredeling. (**Weibullsholm—Swedish Institute of Plant Breeding**).
Meded. Nat. Coöp. Aan- Verkoopver. Landb. Cent. Bur. 1954 : **38** : 73–74.

A brief account is presented of the Plant Breeding Institute at Weibullsholm, Sweden, with special reference to wheat and barley varieties bred there that have proved popular in other countries. Short descriptions of the winter wheat variety Kärn [Kernel] and of the barley varieties Herta, Rika and Balder are included.

1088 Mikaelsen, K.
Radioaktiv bestråling. (**Radioactive irradiation**).
Norsk Landbr. 1955 : **21** : 550–53.

Wexelsen, H.
Radioaktiv stråling. (**Radioactive radiation**).
Ibid. 1955 : **21** : 574–77.

The first of these two popular articles deals with cell structure, chromosomes, genes, spontaneous mutation and the induction of mutation by exposure to ionizing radiation. The second is concerned with the use of ionizing radiations in plant breeding, particular reference being made to work on barley in Sweden and on oats in the USA.

1089 Ploper, J.
Producción de semilla en los EE. UU. de Norteamérica. (**Seed production in the USA**).
Rev. industr. agríc. Tucumán 1955 : **39** : 5–15.

A general account of the work of seed production in the USA includes reference to the breeding operations carried out by some of the seed firms, among these being the production of hybrid maize, the use of male sterility in producing hybrid seed of onions, the use of tetraploids for the production of sterile triploid strains of water melon and other plants and treatment with hormones for stimulating flowering.

1090 Williams, W.
Genetics and plant breeding.
Nature, Lond. 1955 : **176** : 719–21.

An account is given of the Symposium on Genetics and Plant Breeding held at a joint session of the Botany and Agriculture Sections of the British Association at Bristol during 1955. In his opening address, D. Lewis spoke of ways in which desirable variability could be released by the application of modern genetical principles and techniques. G. M. Haskell surveyed reproduction systems in *Rubus* in relation to improvement of this genus. K. Mather classified variability as free or potential, laying emphasis on the problems involved in releasing the potential variability of heterozygous material in which linkage affects a large number of loci. A. J. Bateman pointed out that, as shown by experiments on *Drosophila* and the mouse, use of

methods designed to exhaust the genetic potential often necessitates radical revision of ideas concerning selection limits; breeding procedure should not be allowed to rest on possibly erroneously judged limits of selection. In discussing heterosis, W. Williams stressed that too exclusive approach in interpreting this phenomenon should be avoided if maximum utilization is to be made of this means of transcending the limits of selection. Surveying the literature, D. Lewis concluded that genetic control of pathogens is more likely with insects than with fungi, which appear to be more effectively controlled by chemical methods. R. L. Knight suggested that complex resistance based on major genes and reinforced by modifiers and polygenes from a wide range of material is much less likely to be overcome by mutational specialization in the parasite than resistance due solely to a few major factors, citing the synthesis of complex resistance in the cotton variety Sudan Sakel. G. D. H. Bell outlined the need for crop improvement in terms of the demands and responsibilities of the more technically advanced nations, advocating a closer integration of pure and applied work.

1091 Tsitsin [Cicin], N. V.
My researches in distant hybridization.
Sci. & Cult. 1955 : **21** : 139–48.

The text is given of a lecture delivered at the Bose Institute, Calcutta, in December 1954. The author surveys work on the production of annual and perennial types from wheat-*Agropyron* crosses, referring to the results of tests in 1954. He also describes experiments on grafting between *Caragana arborescens* and herbaceous legumes and between *Cyphomandra* and other members of the Solanaceae (cf. Absts. 274–94).

1092 Murphy, C. F.
Atomic varieties to battle hunger.
What's New Crops Soils 1955 : **8** : No. 1 : 18–19.

The production of desirable mutants by various types of irradiation is discussed in a popular manner with particular reference to work on groundnuts and oats.

1093 Kopetz, L. M.
Selektionsgrundlagen für die Kreuzungszüchtung von Selbstbestäubern. (**Bases of selection for the cross breeding of self pollinators**).
Bodenkultur 1955 : **8** : 230–34.

Mathematical formulae devised to facilitate selection for (*a*) one or more dominant factors; (*b*) an incompletely dominant factor and (*c*) a recessive factor in the F_2 of hybrids of cross-pollinated plants are put forward. The object of the formulae is to enable the breeder to determine what percentage of the F_2 he should retain in each of the above three cases in order to restrict as much as possible the number of F_3 plants he raises while at the same time keeping as many potentially valuable genetic combinations as possible.

1094 García Badell, G.
Origen geográfico y zonas de expansión de nuestras plantas cultivadas. (**Geographical origin and zones of extension of our cultivated plants**).
Agricultura, Madr. 1955 : **24** : 573–78.

Brief outlines are given of what is known concerning the origin of many of the chief agricultural plants and of their entry into cultivation.

1095 Hamada, H.
(On the characters of unhulled rice and soya beans in the remnants of drugs at the Shosoin).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1955 : **23** : p. 276. [Japanese].

Specimens of unhulled rice and soya beans preserved at the Shosoin, a Buddhist shrine founded in the eighth century AD, are described. The weight of the rice grains is 81–86% of that of contemporary varieties; the Shosoin grains could be classified into *japonica, indica* or intermediate types.

The Shosoin soya beans were intermediate in size and shape between the wild form and contemporary Japanese summer varieties. The specific gravity of the Shosoin seeds was considerably lower than in contemporary forms.

1096 Schwanitz, F. & Pirson, H.
Chromosomengrösse, Zellgrösse und Zellenzahl bei einigen diploiden Gigaspflanzen. (**Chromosome size, cell size and cell number of some diploid gigas plants**).
Züchter 1955 : **25** : 221–29.

A wide range of wild and cultivated species was investigated, including representatives of *Hordeum, Triticum, Avena, Setaria, Allium, Rumex, Vicia, Daucus* and *Lycopersicon.* In some, but not all, cases the cells of diploid gigas plants contained larger chromosomes than the cells of nongigas plants to which they were closely related. In most species gigas plants had larger cells than their corresponding nongigas forms and frequently also larger nuclei. However, an increase in cell number, and not

an increase in cell size, was the principal factor contributing to the gigas characters of the plants studied. A few cases were observed in which increase in cell size occurred only in certain organs or at certain stages in the growth cycle.

1097 Covas, G. & Hunziker, J. H.
Estudios cariológicos en antófitas. (**Caryological studies on flowering plants**).
Rev. Invest. agríc. B. Aires 1954 : **8** : 249–53.

In *Bromus macranthus* the chromosome number $2n = ca.$ 70 has been determined, as compared with $2n = 28$ reported in a previous communication, suggesting that this taxon is a polyploid complex. In *Hordeum muticum* $n = 7$ and in *Desmodium supinum* $n = 11$. Chromosome numbers are given for several other Argentine species and for *Verbena supina* from Tunis.

1098 Multamäki, K.
Polyploidiajalostuksesta. (**On polyploid breeding**).
Maatalous ja Koetoiminta 1954 : **8** : 61–70.

A review of the theory and practice of polyploid breeding is given. Reference is made to the cultivation value of tetraploid strains of rye, barley, rye-wheat, Alsike and red clover and sugar beet, which are being investigated in Finland.

1099 Nijdam, F. E.
L'analyse morphologique des caractéristiques agricoles des variétés. (**The morphological analysis of the agricultural characteristics of varieties**).
Acta bot. neerl. 1955 : **4** : 452–59.

It is pointed out that varieties of agricultural crop plants are often not distinguishable on the basis of their external morphological characteristics. In such cases, however, one variety may often be distinguished from another by differences in growth cycle and such factors as time of flowering. As a study of the inflorescence frequently offers the best means of distinguishing between varieties, the author presents a series of examples, based upon varietal differences in the inflorescences of potatoes, French beans and flax, to illustrate how this criterion may be employed in varietal identification.

1100 Dolan, D. D.
The search for new germ plasm.
Fm. Res. 1955 : **21** : No. 4 : p. 3.

The following introductions are mentioned as having shown merit in the 1955 plantings at Geneva, NY: the lucerne PI217419, an upright, bushy and leafy type from Denmark, with more and longer branches than Narragansett; the Ladino clover PI214208 from Israel, displaying a conspicuous leaf pattern, vigour and marked stoloniferous habit; a prolific, mosaic-resistant cucumber from Canada; the snake melon PI222187 (*Cucumis melo* var. *flexuosus*) from Asia; and the tomatoes PI223308, 223309 and 223311, with resistance to skin cracking.

1101 **Development of seed production and the seed trade in Europe.**
OEEC, Paris 1955 : Project No. 214 : Pp. 138.

This publication is the report of the conference held in Stockholm, Sweden, during July 1954 to discuss the recommendations of the Mission on Seed Production, Testing and Distribution in European countries, appointed by the Organization for European Economic Cooperation.
Part I presents the general conclusions and recommendations concerning (1) international variety trials, (2) lists of varieties, (3) the organization of a European Crop Improvement Association and (4) protection of the breeder's products.
Part II comprises the technical contributions. It includes: Seed production in Sweden, E. Åkerberg; present-day status of seed production, testing and distribution in the OEEC participating countries, G. Nilsson-Leissner; the preliminary study of new varieties of cultivated plants from the point of view of the authorities, R. Mayer; testing of new varieties from the point of view of the plant breeder, Å. Åkerman and O. Tedin; the need for uniform variety trials in participating countries, A. Sandison; the standardization of official lists of varieties in participating countries, R. Milatz; the desirability of a uniform international terminology in relation to seed certification schemes, A. Kjaer; possibilities of seed production and multiplication in the most suitable areas of the participating countries, M. Thielebein; and plant breeders' rights, G. Weibull.

1102 Žukovskiĭ, P. M.
(**The problem of immunity of cultivated plants to diseases**).
Problemy Botaniki (Problems of Botany), Akademija Nauk SSSR : 1955 : **2** : 206–22. [Russian].

Various hypotheses concerning the nature of disease resistance are examined; enzyme activity, pigmentation, serological reactions and chromosome number are all considered as possible bases of immunity but found wanting in some respect

or other; in spite of this it is possible for breeders to make use of the innate resistance of certain species and introduce it into crop plants by hybridization. Mention is made of the valuable properties of resistance possessed by *Triticum timopheevi* and the hybrids, such as *T. fungicidum*, produced from it (cf. *PBA*, Vol. XV, Abst. 549); later hybrids have proved resistant also to frit fly. *T. carthlicum* (= *T. persicum*) is resistant to many races of rust and smut but not, as originally supposed, to mildew; *Avena strigosa* is resistant to crown rust, mildew and smut, Cicin's *Triticum* x *Agropyron* hybrids 185, 599 and 690 are immune from smut, and *Sorghum durra-abyssinicum* and *S. bantuorum* from *Sphacelotheca sorghi*. Blight-resistant potatoes have been produced from crosses of several species from Central America but resistance to virus diseases is still a problem; so far, only resistance to certain viruses has been found; thus variety 41956 is resistant to virus X but not to Y or B, other varieties are resistant to Y and A, but in the whole collection at Leningrad no form resistant to all viruses has been found, though *S. antipoviczii* and *S. rybinii* are the most promising in this respect. Cotton 8802 is a hybrid of *Gossypium arboreum* var. *nanking* resistant to gummosis. Reference is made to Soviet tomato hybrids resistant to leaf spot, to bacterial wilt and to big bud, and the tobaccos Trapezond 300, 240 and others, all hybrids from *Nicotiana glutinosa* x *N. tabacum*, resistant to mosaic and high in quality. Examples are also given of subspecies and of individual varieties within a species that are resistant to certain diseases and have maintained their resistance over an extended period. Experience has shown that disease-resistant varieties from Argentina retain their resistance when grown in the Soviet Union, in contrast to many varieties from North America which prove entirely susceptible to the Russian biotypes of rust and other diseases; some Soviet selections that started life as resistant varieties have also lost their resistance in subsequent years; this can sometimes be avoided by alternating different resistant varieties. The winter wheat L–3, produced by crossing the Argentine wheat Klein 33 with Kanred-Fulcaster, is resistant to several of the races and species of rust occurring in the USSR and illustrates the value of the Mičurin method of crossing ecologically widely separated forms.

Acquired immunity is referred to in certain soft wheats in which the embryos had been grafted for a number of successive generations on to the endosperms of resistant species such as *T. timopheevi* and *T. fungicidum*; in some cases the immunity was retained for three years whereas in others it faded out. Various methods of husbandry which tend to reduce the incidence of disease are also mentioned.

CEREALS

1103 **Winter-sown cereals.**
Seed Bull., Hague 1955 : Pp. 13.

Descriptions are given of the main varieties of winter wheat, rye and barley recommended for cultivation in the Netherlands in 1955–56 (cf. Absts. 306, 365 and 408).

1104 Templeton, F. M.
Some new aspects on cereals and their breeding.
Fertil. Feed. St. J. 1955 : **43** : 429–32.

The writer expresses the view that breeding in Britain compares unfavourably with that in some Continental countries as regards legal protection of the products of the breeders' work and small number of organizations involved. In favour of private enterprise, he refers to the cooperation between British farmers and Continental breeders which now makes possible the selection of Continental breeding material by its originators under conditions in Britain.

1105 **Cereal variety trials at the department's schools, 1952.**
J. Dep. Agric. Éire 1953–54 : **50** : 180–95.

Details are given of the dates of ear emergence and ripening, the yields and the weights per bushel of varieties of spring wheat, oats and barley tested at four centres in Éire.

1106 **Annual Report of the Department of Agriculture, Gold Coast, for the year 1953-54** : Pp. 59. (Mimeographed).

Maize. Crosses between local and foreign types were further selected. Weevil-resistant flint types have shown low yielding capacity.

Millet. Selfed progeny of early millet lacked earliness and vigour.

Rice. An attempt is being made to combine the strong straw of two local varieties with the high yields and quality of a variety from N. Borneo.

1107 Clapp, A. L.
1955 experiment station results with fall seeded wheat, barley, oats.
Circ. Kans. agric. Exp. Sta. 1955 : No. 329 : Pp. 21.

A summary of the results of variety trials of winter wheat and barley carried out in different regions of Kansas is included.

1108 Stroun, M. & Ravič, B. V. (Translator)
(Transplanting embryos on to foreign endosperms in cereals).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) 1955 : Ser. biol. : No. 5 : 135–41. [Russian].

At Geneva, embryos of some wheat varieties were transplanted on to endosperms of other varieties of wheat or endosperms of barley or rye. Similarly, embryos of barley varieties were grafted on to endosperms of barley, rye or wheat and embryos of rye on to wheat and barley endosperms. Transplantation, together with varied sowing dates, accelerated or retarded earing of the first seed generation. This is attributed to the shattered inheritance of the experimental plants. It is thought that the period of interaction between the embryo and foreign endosperm is too short to result in major heritable changes, unless these are also promoted by external conditions. In this connexion reference is made to F_1 plants obtained from grafting an embryo of the barley Bond on to the endosperm of the wheat Fylgia; they produced awns half as long as those characteristic of normal Bond plants.

1109 Šarlj-Maton, K. [Charles-Mathon, C.], & Kremjanskiĭ, V. I. (Translator)
(Mičurin's theory in France).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) 1955 : Ser. biol. : No. 5 : 118–25. [Russian].

French experiments on producing heritable changes in cereals, fruit trees, soft fruits and various other plants by the use of Mičurin-Lysenko methods are referred to briefly.

1110 Gfeller, F.
Notes from Canada. Plant growth chambers and their use in plant breeding.
Commonw. Phytopath. News 1955 : **1** : 57–59.

At the Central Experimental Farm, Ottawa, Ont., a growth chamber has been constructed in which it is possible to grow five generations of cereal crops a year under controlled conditions of light and temperature.

1111 Rassenlijst voor landbouwgewassen 1956.
(Varietal list of agricultural plants, 1956).
Meded. Ned. Alg. Keuringsdienst Landbouwzaden Aardappelpootgoed 1955 : **12** : p. 54.

It is announced that the new winter wheat Panter and the new winter barley Herfordia have been added to the Netherlands official list of approved varieties. Panter, a high-yielding, red-grained variety developed at the Gembloux Plant Breeding Station, Belgium, has short, stiff straw and grows best on clay soils. It displays a high degree of winter hardiness and is resistant to yellow rust. It is fairly susceptible to black rust. Herfordia, a recent introduction from Germany, matures early and is winter hardy. Its yields are comparable with those of Trias and Atlas. The straw is medium-long and moderately stiff.

1112 Teittinen, P.
Eräiden kevätviljalajikkeiden sopivuudesta nurmen suojakasviksi. **(On the suitability of certain cereal varieties as nurse crops for herbage plants).**
Maatalous ja Koetoiminta 1954 : **9** : 80–93.

Trials carried out at the Tikkurila Research Centre, Finland, are described in which varieties of oats, barley and spring wheat were compared as nurse crops for herbage plants. Their relative values are examined in terms of the overwintering capacity and yields of clover in one and two-year leys, and the hay yields, crude protein yield and yield of the nurse crop. Results indicate the unsuitability of the oat varieties Golden Rain I and II, which are most commonly used for this purpose, on account of their lateness and weak straw; the wheat varieties Diamond I and II are similarly too late. Tammi barley is most strongly recommended; it ripens over three weeks earlier than Golden Rain II oats.

1113 Horváth, P.
Fagyállomások és télállósági kísérletek. **(Experimental frost stations and experiments on winter hardiness).**
Növénytermelés 1953 : **2** : 102–15.

Information is given on the winter hardiness of 13 winter varieties of wheat, 6 of barley and 7 of rye, tested at experimental stations at Óbánya, near Zirc, and at Matraszentlaszlo, Hungary.

1114 **Winter wheat and oat varieties show greater ascorbic acid content.**
What's New Crops Soils 1955 : **8** : No. 1 : p. 24.

It is reported from College Station, Tex., that winter varieties of wheat and oats have a higher content of ascorbic acid during early stages of growth than spring varieties.

1115 Vasudeva, R. S., Prasada, R., Lele, V. C., Joshi, L. M. & Kak, D.
Prevalence of physiologic races of wheat and barley rusts in India.
Indian Phytopath. 1955 : **8** : 22–51.
Information is given on the occurrence of races of *Puccinia graminis* var. *tritici*, *P. triticina* and *P. glumarum* in the different states of India during 1932–52.

WHEAT

1116 Zomertarwe, 1956. (**Spring wheat, 1956**).
Landbouwvoorlichting 12 : Bijl. 12; Ber. Rassenkeuze 1955 : No. 192 : unpaginated.
Brief descriptions are given of five established varieties and six new varieties tested at different centres and on different types of soil in the Netherlands in 1955. Peko is now the spring wheat most widely cultivated in the Netherlands. On clay soils it was outyielded in 1955 by the new variety Carpo (= Strube's 4090) but gave higher yields on all types of soils than Koga II, Svenno or Phoebus (cf. *PBA*, Vol. XXV, Abst. 1880). The last two varieties have proved highly susceptible to yellow rust.

1117 Briggs, F. N.
Registration of improved wheat varieties, XX.
Agron. J. 1955 : **47** : 543–45.
Descriptions are given of Onas 53 (cf. *PBA*, Vol. XXIV, Abst. 2850), Quanah (cf. *PBA*, Vol. XXI, Absts. 973 and 1691), Frisco (cf. *PBA*, Vol. XXIV, Abst. 1036) and Concho (cf. *PBA*, Vol. XXIV, Abst. 1023), all of which were registered in the USA in 1955.

1118 Wunderlich, G.
Welche Weizensorten baut Amerika? (**Which wheat varieties does America grow ?**)
Bodenkultur 1955 : **8** : 262–73.
Brief details are given of the yielding capacity and disease resistance of approximately 50 of the more important wheat varieties grown in the USA.

1119 **New wheat released.**
What's New Crops Soils 1955 : **8** : No. 1 : p. 25.
Released by the Maryland Agricultural Experiment Station, Tayland is described as having a more uniform production from year to year than older varieties.

1120 Bullen, E. R., Dadd, C. V. & Fiddian, W. E. H.
N.A.A.S./N.I.A.B. trials of winter wheat varieties : 1949-1952.
J. nat. Inst. agric. Bot. 1955 : **7** : 244–69.
Details are given of the yield, frost resistance, tillering, incidence of diseases and pests, time of maturity, straw length, lodging, shedding and other characters of 34 varieties tested on various soil types at numerous stations in England.

1121 Gregg, A. S.
Spring wheat variety trials, 1945-1953.
J. nat. Inst. agric. Bot. 1955 : **7** : 270–76.
Of nine varieties tested in primary trials at 13 stations in England, only Atson consistently outyielded Atle, the control. Details of tillering, early growth, maturity, incidence of disease, straw length, amount of lodging and yield of grain are given for each variety.

1122 Gregg, A. S. & Sharrock, J. N.
N.A.A.S./N.I.A.B. trials of spring wheat varieties 1949-51.
J. nat. Inst. agric. Bot. 1955 : **7** : 277–88.
Details are given of the performance of Atle, Bersée, Brons [Bronze], Fylgia and Meteor in 36 trials conducted at different centres in England. Varietal responses to field conditions and geographical, meteorological and edaphic factors are discussed.

1123 Sandison, A.
A note on spring wheat variety trials results, 1945-51.
J. nat. Inst. agric. Bot. 1955 : **7** : 289–90.
From the combined yield results of the trials reported in Absts. 1121 & 1122, Atle, Atson and Bersée are shown to have given relatively higher yields at high fertility levels than Meteor, Fylgia and probably Brons [Bronze].

1124 Lelley, J.
Magyar nemesített búzafajták. (**Improved Hungarian wheat varieties**).
Magyar tud. Akad. Biol. Agrátud. Oszt. Közl. 1951 : **2** : 229–70.
Full descriptions are given of the morphology and baking qualities of the following varieties, bred in recent years in Hungary. Bánkút 1201 (Bánkút 5 x Marquis) is a winter wheat with good baking quality; it is resistant to drought and lodging. Bánkút 1205 is of similar origin to the preceding variety but is injured by drought. F481 (Fumai 244 x Székács I) is a high yielding variety of particular value in arid localities. Hatvan 5612 (Hatvan 1109 x

Marquis) is useful as a source of smut resistance. Lovászpatonai 160 (Diószegi 100 x Eszterházai 18) has moderately good yielding capacity and baking quality but is now passing out of favour. Székács 1055 is useful for breeding on account of its high resistance to drought and frost.

1125 Pollhamer, E.
Kísérleti adatok külföldi búzafajták gazdasági és nemesítési értékéről. (**Experimental data on the value of foreign varieties for cultivation and breeding**).
Növénytermelés 1953 : **2** : 28–36.

Details are given of the incidence of disease, resistance to lodging, plant height, yield, quality and other characteristics of 28 native and introduced winter wheats tested in 1951–2 at the Research Institute for Crop Production, Martonvásár, Hungary. Erythrospermum 287 and Arpádahalmi 17 appeared to be of value for further breeding.

1126 Papp, Z.
Növényfajták értékvizsgálati módszerei. (**Methods of evaluating plant varieties**).
Növénytermelés 1953 : **2** : 247–50.

Results are presented of four years' yield trials of five Hungarian wheats tested on various soil types in six regions in Hungary with a view to determining the extent of environmental influence. The variety F 481 surpassed all others in all districts, particularly on poor soils, while B1201 did well only on fertile soils.

1127 Bonvicini, M.
Le nuove varietà di grano dell'Istituto di allevamento vegetale di Bologna. (**The new wheat varieties of the Bologna Plant Breeding Institute**).
G. Agric. Domen. 1955 : **65** : p. 327.

Descriptions are given of five new wheats that seem to be specially promising. Falchetto [Little Falcon] is a form of *Triticum vulgare* suitable for southern Italy; it is a hybrid from Falcone [Falcon] x Lauro Bassi, is early, remains free from rust and lodging and has given exceptionally high yields of grain.
I.Bo. 1828, from Florio x Lauro Bassi, is early and, although somewhat defective in resistance to cold, rust and lodging, has also given extremely high yields. I.Bo. 1494, from Funo x Lauro Bassi, is highly resistant to rust and excels even Funo in yield, having exceeded 70 c. per ha. in the Bologna area. I.Bo. 1535, also from Funo x Lauro Bassi, is awnless and has short straw very free from lodging. I.Bo. 1373, from Fiorello x Lauro Bassi, is early and free from rust and lodging and has yielded between 60 and 70 c. per ha. in the last few years.

1128 Zucchini, M.
Le varietà elette di grano nelle prospettive cerealicole del Lazio. (**Élite varieties of wheat in the future prospects for cereal growing in the Lazio**).
Ital. agric. 1955 : **92** : 707–11.

A notable increase in both the area under wheat and the yields in the province of Lazio in central Italy is partly ascribable to the improved varieties that are now available. Funo, Mara, R37 and S. Pastore are recommended for lower ground, Autonomia [Autonomy], Vivenza, Generoso [Generous] and Funo for less fertile soils, Est-Mottin [Mottin East], Ovest [West] and Verna for higher ground and M5 and Autonomia for mountainous areas. Titano [Titan] and S. Marino are also recommended for further trial.

1129 Wålstedt, I.
Svalöfs Drottvårvete. (**Svalöf Drott spring wheat**).
Sverig. Utsadesfören. Tidskr. 1955 : **65** : 245–56.

Selected at the Östgöta Branch Station of the Swedish Seed Association from a cross between Fylgia I and Ög 0990 (Extra-Kolben I x Rubin), Drott [King] is medium early and high yielding and has a fairly large plump kernel of acceptable baking quality. Its straw strength is greater than that of Kärn II [Kernel II] but slightly inferior to that of Svenno. Resistance to shattering is good. Drott has done particularly well in trials in the eastern part of central Sweden.

1130 Pavličić, J.
Strane sorte pšenice u našim uslovima gajenja. (**Foreign wheat varieties grown under our conditions**).
Arh. poljopr. Nauk. 1955 : **8** : No. 19 : 68–106.

A collection of spring and winter ecotypes, differing widely in their geographical origin, has been tested at Zemun, and the following winter wheats were found to be of practical value for Jugoslavia. Varieties from the Pannonian plain and the northern Balkans were the best adapted on account of their hardiness, drought resistance and tolerance of variable winter temperatures. Among these some Rumanian varieties even excelled the Jugoslav standards in these and other economic characteristics and, hence, may be introduced without any further improvement by selection or hybridization.

Varieties from the USA were characterized by good baking properties, those from the USSR by hardiness and drought resistance, from Japan by a short growth period, from the Mediterranean by lodging resistance and from Australia by lodging resistance and high quality. It is thought that these valuable characteristics could be transferred to Jugoslav varieties by hybridization.

1131 Silvela, F., Pardeiro, J. M. & Martín Vargas, V.
Los trigos rojos bastos de Burgos. (**The local red wheats of Burgos**).
Bol. Inst. Invest. agron., Madr. 1955 : **15** : 327–34.

Data on composition, gluten content, fermentation time and other properties are presented for 40 wheat samples from the Spanish province of Burgos. They are all soft but give satisfactory dough when reinforced with strong flours.

1132 Veatch, C.
Winter wheat variety trials in West Virginia, 1949-1954.
Bull. W. Va. agric. Exp. Sta. 1955 : No. 374 : Pp. 12.

The results of trials carried out on varieties and selections of soft red winter wheat at five centres during 1949–54 are summarized. The varieties recommended are Butler, Seneca, Thorne and Nured, the last-mentioned being primarily a fodder type.

1133 Huttunen, E.
Terä-kevätvenhä. (**Terä spring wheat**).
Maatalous ja Koetoiminta 1954 : **8** : 51–53. and; Siemenjulk. Hankkijan KasvinjalosLaitos Tammisto 1955 : 113–14.

Brief accounts of Terä [Edge] spring wheat, derived from Hopea [Silver] x Tammisto strain 04609 are given, with comparisons with Timantti [Diamond], Touko [Sowing] and Kimmo [Elasticity]. It is early, high yielding, of good baking quality and unaffected by soil acidity and is recommended for cultivation in southern and central Finland.

1134 Fowler, W. L. & Heyne, E. G.
Evaluation of bulk hybrid tests for predicting performance of pure line selections in hard red winter wheat.
Agron. J. 1955 : **47** : 430–34.

The F_2 to F_5 generations of 45 bulked hard red winter wheat crosses and their ten parents were tested at Manhattan, Kans., and their performance compared with that of selections from the parents and from the F_5 of each bulk hybrid. The plant height, maturity and test weight of the hybrid selections could be reliably predicted from the performance of both bulk hybrids and parents in respect of these characters.

1135 Šulyndin, A. F. & Manzjuk, V. T.
(**Effects of parent varieties and external conditions upon the vitality of the hybrid progeny in spring wheat**).
Agrobiologija (Agrobiology) 1955 : No. 4 : 28–36. [Russian].

At Harjkov, rate of survival, plant height and dry matter content during different growth phases, viability, grain weight and grain yield per plant were taken as indices of vitality and corresponding data for a number of F_1, F_2 and F_3 hybrids, grown under rainfed conditions or upon rich moist soil, are presented.
Analyses showed that hybrids from crosses involving productive local wheats as seed parents possessed a high degree of vitality. Hybrids raised in the previous year upon rich moist soil gave progenies superior in vitality to those that had been grown under rainfed conditions.

1136 Kiričenko, F. G. & Kiričenko, M. S.
(**Winter forms of hard wheat**).
Dokl. Akad. seljskohozjaĭstv. Nauk Lenin (Proc. Lenin Acad. agric. Sci.) 1955 : No. 3 : 13–19. [Russian].

The production of hard winter wheats at Odessa by direct and reciprocal crossing between soft winter wheats and hard spring wheats and by back crossing the resulting hybrids in the later generations to soft winter varieties is described. Some hybrids with 28 chromosomes, notably Odessa 3 (soft wheat) x Hordeiforme 26114 (hard wheat) and Odessa 3 x mixed pollen of hard spring wheats, were productive and showed good overwintering ability. These characteristics were further improved by crossing the material with soft wheats. Some hard wheat forms so obtained surpassed Odessa 3 in hardiness under laboratory conditions.

1137 Shida, S.
(**Some triploid cereal hybrids**).
Senshokutai (Chromosome)/Kromosomo 1955 : No. 22–24 : 794–97. [Japanese].

Studies on the fertility and cytology of F_1 and F_2 hybrids involving *Triticum durum* and *T. timopheevi* on the one hand, and *T. aegilopoides*, *T. monococcum* and *Secale cereale* on the other,

are reported. In the intrageneric crosses between the *Triticum* species, the modal number of bivalents was 6–7; in *T. durum* x *S. cereale*, the modal number of bivalents was 0 though 4_{II} was observed in one case. F_2 hybrids of *T. durum* x *T. aegilopoides* with 34 and 35 chromosomes were obtained; the number of bivalents was 11–14. An F_2 plant of *T. timopheevi* x *T. aegilopoides* with $2n = 21$ (5–7 bivalents) was raised too.

1138 Pané Mercé, J.
Descendencia de un cruce interespecífico. **(Progeny of an interspecific cross).**
Agricultura, Madr. 1955 : **24** : 579–81.

In spite of their numerous defects (cf. *PBA*, Vol. XXIV, Abst. 997) the branched wheats are of interest on account of their capacity to bear up to 250 grains per ear and their resistance to all three rust species, and the branched wheat Pané 149 (cf. *loc. cit.*) has been back crossed with the *Triticum vulgare* variety Littorio. The hybrids produced include 1.005, characterized by extremely strong straw; this and several other hybrids are rust resistant, branched and possess better grain quality than Pané 149.

1139 Pissarev [Pisarev], V. E.
Die Amphidiploiden "Sommerweizen x Sommerroggen". **(The spring wheat x spring rye amphidiploids).**
Z. Pflanzenz. 1955 : **35** : 27–50.

Descriptions are given of amphidiploid spring wheat x spring rye hybrids obtained at the Institute for Cereal Cultivation in the Non-chernozem region of the USSR by treating grains obtained from wheat plants pollinated with rye pollen with a 0·2% colchicine solution. The results obtained by employing this technique varied considerably according to the wheat plant used as the ♀ parent; wheats from China and eastern Siberia gave the best results as regards the percentage of successful crosses effected. The amphidiploid hybrids of crosses between spring wheat and spring rye gave higher yields of grain and straw than the wheat parent, this higher yield being particularly pronounced in crosses in which the wheat variety WIR29087, a selection from Chinese material, was used as the ♀ parent. The grain resembled that of wheat, except that it was somewhat longer. It had good baking properties and its content of crude protein was up to 33·6% higher than that of wheat. The plants, which grew faster in the juvenile stage than wheat and were so better enabled to resist attack by fungous diseases and insect pests, had dark-green leaves and were taller and more luxuriant than the wheat parent. They were also more resistant to lodging and not as exacting in their soil and climatic requirements.

1140 **Finds high resistance to rust in wild grass; transfers it to wheat.**
What's New Crops Soils 1955 : **8** : No. 1 : p. 23.

By X irradiation of the offspring of a cross between common wheat and *Aegilops umbellulata* x Emmer, 16 strains have been obtained at Columbia, Mo., which carry the leaf-rust immunity of *Ae. umbellulata*; all but three strains also carry some of the undesirable characters of the last species.

1141 Sears, E. R.
An induced gene transfer from *Aegilops* to *Triticum*.
Genetics 1955 : **40** : p. 595. (Abst.)

"The chromosomes of *Triticum aestivum* ($n = 21$; genome formula ABD) were combined with those of *Aegilops umbellulata* ($n = 7$; C^u) by hybridizing *T. aestivum* with the amphiploid *T. dicoccoides* ($n = 14$; AB) x *Ae. umbellulata*. The resistance of *Ae. umbellulata* to leaf rust, *Puccinia triticina*, proved to be epistatic to the susceptibility of the wheat material. After two backcrosses to *T. aestivum*, a resistant plant was obtained with the full 21 pairs of wheat chromosomes and a single *Aegilops* chromosome. This chromosome had a deleterious effect on the plant and on pollen performance as well. Plants with an added derived isochromosome involving the resistance-carrying arm were X-rayed previous to meiosis, and later were used to pollinate normal, untreated plants. Of the 6091 offspring, only 132 were resistant, and 50 of these had a translocation involving the *Aegilops* chromosome. At least 16 different translocations were represented, most being reciprocal translocations. One translocated chromosome, which evidently had an *Aegilops* centromere and two doses of resistance, showed by its pairing behaviour that the resistance gene is located near the centromere. Each reciprocal translocation therefore involved almost the entire arm of the *Aegilops* chromosome. Male transmission of resistance from heterozygotes was only about 5%. Four translocations had higher male transmission rates, ranging from 27% to 43% and suggesting that these four were intercalary rather than reciprocal translocations. The one with 43% transmission has no detectable effect on the plant except to confer resistance and to delay maturity slightly under some conditions".

1142 NAKAJIMA, G.
(Cytogenetical studies on F_1 plants of *Triticum compactum* x *Secale cereale*).
Senshokutai (Chromosome)/Kromosomo 1955 : No. 22–24 : 816–23. [Japanese].
The F_1 hybrids were intermediate between the parents morphologically though more closely resembling *T. compactum*. The modal metaphase configuration of the hybrids was $0_{II} + 28_I$. A certain degree of end-to-end chromosome association was noted. The hybrids were highly sterile though a few grains set naturally.

1143 VILLAX, E., MOTA, M. & PONCE-DENTINHO, A.
Dois novos *Triticales*. **(Two new *Triticales*).**
Melhoramento 1954 : **7** : 29–56.
Further reference is made to the hybrids resembling Ardito obtained from colchicine treatment of an Ardito x Petkus hybrid (cf. *PBA*, Vol. XXIV, Abst. 204). A number of further crosses have been made between wheat and rye but hybrids were obtained only from Ardito x Petkus and Ardito x Centeio do Alto [Highland rye]; from colchicine treatment applied to the roots one fertile plant of the latter hybrid was obtained. It had $2n = 56$ and was intermediate in type, resembling the wheat parent more than rye; in some characters such as length of ear it showed heterosis. Another hybrid of Ardito x Centeio do Alto was injected with colchicine as in the experiment previously described but this time no shoots with chromosome duplication were produced. The plants remained sterile and only 1–3, or occasionally 4, bivalents were observed at meiosis. In certain pollen mother cells a separate group of chromosomes was observed in addition to the main group; the second group was delayed in division and may represent a stage in the loss of a genome such as was assumed to have occurred in the production of the Ardito plant previously described.
The F_2 from the fertile plant of Ardito x Petkus from the earlier experiment had $2n = 56$ and showed fairly regular pairing at meiosis.

1144 OHLENDORF, A.
Weitere cytologische Untersuchungen an Weizen-Quecken-Bastarden. **(Further cytological studies of wheat-*Agropyron* hybrids).**
Züchter 1955 : **25** : 331–51.
Further to previous cytological studies on *Triticum aestivum* x *Agropyron intermedium* hybrids (cf. *PBA*, Vol. XXII, Absts. 2587–8), the author presents the results of studies of the F_2 to F_9 back-cross progenies of the above hybrids to wheat. The back crosses were extremely variable in fertility, morphological characters and grain quality and their chromosome numbers ranged from 41 to 63 in the F_2. By the F_6–F_7, however, they tended to become stabilized at $2n = 42$ or 56; lines with other chromosome numbers survived but they were considerably inferior in vitality to the two main groups. Plants with a high chromosome complement possessed many of the characters of the *Agropyron* parent whereas those with a low chromosome complement closely resembled wheat. In order to obtain information on the extent to which *Agropyron* characters such as resistance to brown rust and mildew could be transferred to wheat a study was made of plants in which *Agropyron* genes had replaced *Triticum* genes and of plants with $2n = 44$–56 possessing the full *Triticum* chromosome complement ($2n = 42$) and additional *Agropyron* genes. In the former category one line, TA15III, was found in which an entire *Agropyron* chromosome had replaced a *Triticum* chromosome and another, TA15IIa, in which a segment of an *Agropyron* chromosome had replaced the corresponding segment of a wheat chromosome. In the second category the line TA25 was shown to possess an intact *Agropyron* genome in addition to having 42 *Triticum* genes. By repeated back crossing to *Triticum aestivum* it is hoped to obtain lines in which only the requisite genes for disease resistance from the *Agropyron* parent are retained in addition to the full complement of *Triticum* genes.

1145 LARTER, E. N.
The use of ionising radiations in the possible utilization of an *Agropyron* source of bunt resistance.
Diss. Abstr. 1955 : **15** : Publ. No. 11,847 : 664–65.
Seed from a 56-chromosome *Triticum vulgare* x *Agropyron* hybrid was exposed to various sources of ionizing radiation, including X rays, thermal neutrons, S^{35} and P^{32}, in an attempt to induce chromosome breakage and translocations, the ultimate aim being to transfer genes governing bunt resistance from the hybrid to a hexaploid wheat. In respect of survival, number of interchanges per cell and fertility of the X_1 plants, the most efficient X-ray treatment used was the lowest (10,000 r). Treatment with P^{32} or S^{35} was less effective than thermal neutrons or X irradiation in inducing interchanges.

Chromosome numbers of inoculated but bunt-free X_2 plants ranged from $2n = 42$ to $2n = 56$, with a distribution skewed towards the higher values. Genetic stability and bunt resistance were retained in individuals with the lower chromosome numbers, suggesting that resistance involves only a few *Agropyron* chromosomes. Disease-free X_2 plants with 43 chromosomes were crossed with monosomic individuals of the wheat Chinese Spring in 1954 but their progenies have not yet been analysed.

1146 Stubbe, H.
Über die Umwandlung von Winterweizen in Sommerweizen. (**On the conversion of winter wheat into spring wheat**).
Züchter 1955 : **25** : 321–30.

Experiments carried out at the Institute for Research on Crop Plants, Gatersleben, and at the Institute of Genetics, Halle University, failed to substantiate claims by Lysenko and his associates that winter wheats could be converted into spring wheats by planting the seed in spring for several generations without previous cold treatment and selecting each year for rapid initial vegetative growth (cf. *PBA*, Vol. XXV, Abst. 2899). When sown in spring in a greenhouse the variety Kaschitzer Winterweizen [Kaschitz winter wheat] segregated into two forms, the one a typical winter wheat and the other an alternative wheat. This variety would thus appear to comprise a population of two morphologically identical lines reacting differently to external environmental conditions. The author suggests that the findings of Lysenko and other Russian research workers may have their foundations in the erroneous interpretation of similar cases.

1147 Gluhih, K. A.
(**Changing spring wheat into winter wheat**).
Agrobiologija (Agrobiology) 1955 : No. 5 : 136–37. [Russian].

At Kirov, the spring wheat Tulun 70 was sown in late autumn for several generations, thereby acquiring the winter habit. Plants that had overwintered for four generations comprised only late-maturing, awnless forms resembling var. *lutescens*. Most of them surpassed the standard Lutescens 116 in yield and about one third exceeded it in hardiness. Breeding work on this material continues, and new experiments on the spring wheats Milturum 553, characterized by a long vernalization phase, and Kauka, notable for productive ears and resistance to lodging, have begun.

1148 Nečiporčuk, I. D.
(**A winter form of hard wheat, *Triticum durum***).
Dokl. Akad. seljskohozjaĭstv.Nauk Lenin (Proc. Lenin Acad. agric. Sci.) 1955 : No. 3 : 20–21. [Russian].

A description is given of a hard wheat characterized by winter habit, large grain and resistance to lodging, shedding and diseases. It was found as a component of a soft wheat population grown in the Drogobyč province and was identified as *T. durum* var. *niloticum*. It is regarded as promising material for breeding hard winter wheats and is under observation at the Ljvov agricultural institute.

1149 Sinskaja, E. N.
(**The origin of wheat**).
Problemy Botaniki (Problems of Botany). Akademija Nauk SSSR : 1955 : **2** : 5–73. [Russian].

An examination of the fertility relationships between the existing species of *Triticum, Agropyron, Aegilops, Secale* and related genera leads the author to devise a phylogenetic scheme in which the subtribe Aegilopinae is derived from an original prototype, the Protohordeae, with $2n = 10$, which gave rise to the subtribes Elyminae, Hordeinae and a group *Protoelytrigia* which in turn gave rise to the modern subgenus *Elytrigia* of *Agropyron* on the one hand and to the Aegilopinae on the other, these comprising *Eremopyrum, Triticum, Aegilops* and, somewhat apart, *Secale* and *Haynaldia*. The genus *Triticum* itself is clearly polyphyletic. The Einkorn wheats evolved in relatively arid, high-lying areas in the Near East; little difference is found between the wild and cultivated forms and the domestication of these species is thought to have taken place after, rather than before, that of the Emmer wheats, probably from plants growing as weeds in fields of Emmer or barley. Crossing results show that *T. dicoccoides* is quite distinct from *T. araraticum* in its relationships, the latter being more closely related to *T. timopheevi* while *T. dicoccoides* stands closer to the other wheat species. The endemic Georgian species *T. macha* ($2n = 42$) and *T. palaeocolchicum* ($2n = 28$) possess features characteristic of the wild wheat species and of *T. vulgare, T. dicoccum* and *T. durum*. In spite of being a hexaploid species *T. macha* crosses with most of the 28-chromosome species and gives fertile hybrids, the later generations of which contain forms resembling *T. dicoccoides*; it crosses somewhat less readily with *T. timopheevi* and *T. araraticum* and will cross even with *T.*

monococcum, giving hybrids some of which display resemblances to *T. vulgare* and *T. spelta*. With *T. vulgare*, some forms of *T. macha* give fertile hybrids from which all possible types segregate out, whereas others either do not cross or give nonviable offspring. The author agrees with Menabde (cf. *PBA*, Vol. III, Abst. 190) in regarding these wheats as primitive "integral" forms from which the majority of later forms have been evolved by specialization. This view is supported by the discovery of wheats of this type in Neolithic finds at Colchis in Georgia and also in early Bronze-age finds from the Urartu period in Armenia. These wheats show close resemblances to the *T. antiquorum* of the lake dwellings of Europe and are thought to represent the primitive form, *T. protomacha*, which was probably brought to Europe by early settlers from Transcaucasia. Specimens from Sumeria, ancient Egypt and elsewhere are also clearly identifiable with it. Even the present-day Ethiopian wheats display many common features with this type, being a group of 28-chromosome wheats showing resemblances to *T. vulgare*, *T. compactum* and *T. persicum* as well as to both *T. durum* and *T. turgidum*, though differing from them all in many features; for this reason the author prefers to consider the group as a distinct species, *T. aethiopicum* (cf. *PBA*, Vol. II, Abst. 581 and Vol. XXIV, Abst. 1015); it is regarded as a direct descendant of the wheat of ancient Egypt, which is hence referred to not as *T. antiquorum* but as *T. protoaethiopicum*; it too probably had its origin in ancient Georgia and was brought in early times from there into Egypt and the adjacent territories, in a form closely resembling *T. protomacha* and the Colchic wheats of today. *T. protomacha* is thus regarded as representing the first cultivated wheat, which was domesticated at a time when the Colchic climate was mild and humid. It was a naked-grained alternative wheat with a tough rachis; it was awnless, the opinion being expressed that awned forms developed only when these wheats spread into more arid zones. When these wheats later passed again into humid zones secondary awnless forms and *inflatum* types developed.

The evolution of the wheats is thus envisaged as follows: *Protoelytrigia* gave rise in arid areas to the sections *Monococca* and *Dicocca*, the former without change of chromosome number, the latter along two tetraploid lines represented by *T. dicoccoides* on the one hand and *T. araraticum* and *T. timopheevi* on the other. A third line gave rise to *Elytrigia*, with *Agropyron intermedium* ($2n = 42$) and *A. elongatum* ($2n = 70$), and to *Prototriticum*, from which *T. protomacha* ($2n = 42$), *T. palaeo-colchicum* ($2n = 28$), *T. protoaethiopicum* ($2n = 28$) and *T. antiquorum* (probably $2n = 42$) arose as geographical subspecies; both *T. protomacha* and *T. antiquorum* gave rise to *T. compactum* and later to lax-eared *T. vulgare*, from which *T. sphaerococcum* and *T. spelta* arose at a later date. Branched forms (*T. vavilovi*) arose in several species and are not considered to be separate species. *T. durum* is regarded as including *T. turgidum*, the whole group having evolved from *T. protoaethiopicum*, while *T. dicoccum* evolved from *T. protopalaeo-colchicum*, as did *T. persicum*. On this basis a new classification of *Triticum* is presented, comprising 14 species, or 15 counting *T. urartu*. Chromosome number is only one of the many characters taken into account and is not regarded as the basic criterion in defining the species. The author does not share the view of other investigators concerning the hybrid origin of *T. vulgare*; the appearance of forms resembling *T. vulgare* in crosses of *T. macha* x *T. monococcum* and other combinations is regarded as without significance in this connexion. It is pointed out that the number $2n = 42$ is already present in *T. macha* and in a number of species of *Elytrigia*. Any of the primitive wheats is thought to have been capable of giving rise to bread wheats under suitable climatic and other conditions and *T. vulgare* is conceived as being a polyphyletic species that has arisen by a repetition of this process in different parts of the world; from *T. protomacha* in Transcaucasia, from *T. protoaethiopicum* in Africa and from *T. antiquorum* in Europe. The process may still be happening, as the possibility of interspecific conversion has been demonstrated by Lysenko and his colleagues. Moreover, the process is not confined to wheat but is envisaged for the cereals as a whole; parallels are pointed out between the primitive barleys of the lake dwellings and *T. antiquorum*; round-grained barley has been found with *T. macha* in the Transcaucasian excavations and the two are thought to have evolved together towards the barleys and bread wheats of today; *Hordeum humile* and the barleys of the Far East are regarded as a close approximation to the primitive Transcaucasian type, which must, it is argued, have been a six-rowed, awnless, tough-eared barley adapted to relatively humid conditions; this type gave rise to the cultivated barleys on the one hand and on the other to *H. spontaneum*, which is not considered to be a possible forebear of the cultivated group. Similar views are put forward regarding the

relationship between *Avena fatua* and *A. sativa* and the other cultivated oats, all of which probably arose from an integral ancestor of the type of *A. ludoviciana.*
A table is given of the characters in the Gramineae regarded as primitive and of the corresponding features considered to be progressive in the evolutionary sense and the relative value of the different characters is examined.

1150 Irlenbusch, J.
Herkunftswert und Ernteertrag beim Winterweizen. (**Provenance value and harvest yield in winter wheat**).
Dtsch. Landw., Berl. 1955 : **6** : 427–33.

Data are provided on the comparative yields of different provenance types of the winter wheats Bastard II [Hybrid II], Criewener 192, Derenburger Silber [Derenburg Silver], Hadmersleben IV and Kleinwanzleben, tested at six centres in Eastern Germany in 1953 to discover whether differences exist between provenance types of the same variety when grown under identical environmental conditions. It was found that provenance was in many cases as important a factor as variety in determining yield potential; in addition, the order of merit in which varieties and provenance types were placed varied considerably according to the locality in which they were grown.

1151 Djokić, A.
[**A study of the F_3 and F_4 generations of intergeneric hybrids of (*Aegilops ventricosa* x *Triticum dicoccum*) x *T. vulgare***].
Zborn. Rad. poljoprivred. Fak./Rev. Res. Wk. Fac. Agric., Beograd 1955 : **3** : 99–112. [Serbian].

The F_3 and F_4 of hybrids produced at Versailles have been studied at Zemun. They showed great variability and were intermediate between the three parental forms in respect of ear length, plant height, tillering capacity, firmness of attachment of the glume, ear colour and shape and colour of grain. In the F_3 the chromosome number varied from 45 to 56 and was uncorrelated with such characteristics as grain set, length and compactness of the ear, plant height and presence or absence of awns. Univalents were frequent at meiosis. The hybrids were of no practical value as they produced lax ears and set few grains. It is concluded that intergeneric hybrids between *Aegilops* and *Triticum* with good economic properties can only be obtained by back crossing the hybrids to wheat twice or thrice in succession.

1152 Nishikawa, K.
(**Giant chromosomes in the antipodal cells of *Aegilops squarrosa* L.**).
Senshokutai (Chromosome)/Kromosomo 1954 : No. 20 : 724–27. [Japanese].

Giant chromosomes are formed in the antipodal cells of *Ae. squarrosa* following selfing or pollination by *Triticum dicoccum.* The giant chromosomes are caryotypically similar to the chromosomes of normal somatic cells.

1153 Rédei, G., Győrffy, B., Makó, J. & Váróczy, E.
Őszi búzából tavaszi búza. (**Spring wheat obtained from winter wheat**).
Növénytermelés 1953 : **2** : 227–37.

This is an account in Hungarian of the work described in *PBA*, Vol. XXV, Abst. 919.

1154 Pascale, A. J.
Método para determinar las características bioclimáticas de una variedad de trigo. (**A method of determining the bioclimatic characteristics of a wheat variety**).
Meteoros, B. Aires, 1955 : **5** : 5–18.

The technique is as follows. Vernalized seed of the variety to be studied is sown on successive dates between March and October. For each sowing the heliothermic index [(sum of temperatures) x mean day length] for the period between sowing and heading is determined. The indices are then plotted against sowing date and the curve so obtained compared with the corresponding curves of standard varieties. By way of example, the recently introduced wheat Presidente Perón MAG was compared with four standard varieties at Castelar and at Rafaela, Argentina.

1155 Teltscherová, L.
K otázkám stadijnosti československých pšenic a ječmenů. (**Questions relating to phasic development of Czechoslovakian wheats and barleys**).
Věd. Prace vyzk. Ústav. rostlin Výrob. 1955 : 9–39.

Vernalization and light phases for a large number of Czechoslovakian spring and winter varieties of wheat and barley have been determined and are discussed in relation to adaptability of the varieties in the diverse climatic zones.

1156 Činoĭ [Chinoy], J. J.
(**The research of Mičurinist biologists in India**).
Agrobiologija (Agrobiology) 1955 : No. 4 : 317–24. [Russian].

The Mičurinist thesis of cumulative action of

external conditions upon heritable characteristics in plants is borne out by the author's own observations on the effects of vernalization and photoperiodic treatments upon wheats, notably the F_2 of NP4 x NP165 and Novinka [Novelty] x NP165. It is stated that the effect of the treatments upon such characters as early or late flowering can be intensified by environmental training in subsequent generations (cf. *PBA*, Vol. XXI, Abst. 2539).

1157 Barnard, C.
Sterile base florets in *Triticum*.
Aust. J. Bot. 1955 : **3** : 149–64.

The morphology of the sterile basal florets found in three mutants of *T. aestivum* carrying the respective sterility factors St_1, St_{1A} and St_2 is described. It is postulated that the *St* genes, the presence of one of which may cause abortion or suppression of the anterior stamen or abortion of the flower rudiment in the sterile floret, inhibit the production of a substance controlling the initiation and development of the flower primordia (cf. *PBA*, Vol. XX, Abst. 1546).

1158 Greer, E. N.
Milling and baking tests on trial wheats.
J. nat. Inst. agric. Bot. 1955 : **7** : 291–96.

In a comparison of twelve varieties with Bersée, Juliana and Atle, only Pilot and N59 were found to be hard milling wheats; no variety was of very good bread-making quality, Yga Blondeau, Franc Nord and Cappelle Desprez being the best.

1159 Rédei, G. & Rédei, G.
Developing wheat embryos excised from ovaries cultured *in vitro*.
Experientia 1955 : **11** : 387–88.

The technique described consists of taking wheat ovules 2–4 days after anthesis, culturing them *in vitro* for 8–12 days on an unspecified medium and then excising the embryos, which are subsequently placed in a fresh medium of the same substance supplemented with 0·5% casein hydrolysate. Normal seedlings were obtained by this method, which was developed at the Institute of Genetics, Budapest, Hungary.

1160 Mathon, C. C.
Note sui grani a spighe ramificate. (**Notes on wheats with branched ear**).
Nuovo G. bot. ital. 1954 : **61** : 345–56.

Descriptions of the morphology and phasic requirements of a series of *Triticum turgidum* varieties with branched ears are given. The varieties emanated from various localities in western Europe and the USSR and were investigated at the National Museum of Natural History, Paris.

1161 Erroux, J.
Les blés du Fezzan. (**The wheats of the Fezzan**).
Bull. Soc. Hist. nat. Afr. N. 1954 : **45** : 302–17.

The more important morphological characteristics of the glumes, ears and grains of the principal forms of *Triticum vulgare* var. *oasicolum* found in the Fezzan district of the Sahara are given, together with their local names. Six main groups, designated *T. vulgare* var. *oasicolum* ff. *hostianum, subhostianum, subhostianum inflatum, erythrospermum, suberythrospermum* and *suberythrospermum inflatum* are recognized and their agronomic merits are mentioned briefly. The results of experimental crosses between these forms and cultivated wheats of European origin, carried out at the National School of Agriculture, Algiers, also receive mention.

1162 Chavan, V. M., Argikar, G. P., Hattiangadi, P. S. & Salanki, M. S.
Inheritance of waxy bloom in wheat plants.
Curr. Sci. 1955 : **24** : p. 314.

In *Triticum durum* crosses in which the Canadian variety Gaza was crossed with the local selections 485–56 and 39–1, waxy bloom was recessive to the wax-free condition and monogenically determined.

1163 Villanueva Novoa, R.
Herencia del color de las aurículas de trigo. (**Inheritance of auricle colour in wheat**).
Inf. mens. Estac. exp. agríc. La Molina 1955 : **29** : No. 337 : 15–16.

The F_2 of the cross H–44–Marquis (green auricles) x Kenya 58 (reddish auricles) segregated into 219 with reddish: 76 with green auricles, indicating a single gene difference. This was confirmed by the F_3 figures.

1164 Grillot, G.
La sélection qualitative des blés au Maroc. (**The qualitative selection of wheats in Morocco**).
Bull. Éc. franç. Meun. 1954 : 1–7.

Breeding work on wheats at the Rabat Centre of Agronomic Research since 1921 is reviewed, with special reference to breeding there for improved baking quality, begun in 1929. At the present time Morocco possesses a wide range of high-yielding soft and hard wheats of

good baking quality, many of which have originated from the Rabat station. The principal characteristics, including productivity, yield and number of days to maturity, are given for the most widely cultivated of these varieties.

1165 Harris, R. H. & Bruner, G. H.
Effect of wheat variety and growth location upon the specific volume of flour.
Cereal Chem. 1955 : **32** : 415–20.

An apparatus for determining the specific volume of flour is described. The values obtained for ten varieties grown at six stations in North Dakota showed highly significant intervarietal differences and smaller but also highly significant environmental differences, wheats of unsatisfactory milling quality having the greatest specific volume of flour.

1166 Millington, A. J.
The protein content of some Australian wheat varieties.
J. Aust. Inst. agric. Sci. 1955 : **21** : 59–68.

The relationship between yield and protein content is discussed with reference to data from trials in Queensland, South Australia and Western Australia during the 1953–54 season. For a given region, protein production per acre tended to be relatively constant irrespective of variety, higher yield generally being associated with lower protein content (cf. *PBA*, Vol. XXIV, Abst. 2842). The possibilities of obtaining increased protein yield are discussed mainly with reference to physiological factors and to agronomic measures. More attention should be given to water absorption in breeding programmes.

1167 Wagner, S.
"Cappelle" ein neuer Winterweizen auf dem Richtsortiment des Schweizerischen Saatzuchtverbandes. (**Cappelle, a new winter wheat in the official assortment of the Swiss Seed Growers' Association**).
Mitt. schweiz. Landw. 1955 : **4** : 161–69.

The results are summarized of variety trials in which the French variety Cappelle was compared with Probus and Mont Calme 245 (cf. *PBA*, Vol. XXV, Abst. 897). In most localities, especially in western Switzerland, Cappelle gave significantly higher yields than either of the other two varieties. However, in high mountainous districts with inclement climates or in years with low summer temperatures, it failed to do as well. Among Cappelle's defects are its lack of winter hardiness, its susceptibility to black rust and the inferior baking quality of its flour, compared with the two Swiss varieties.

1168 Les variétés de céréales expérimentées par le Service de la Recherche Agronomique au Maroc. (**Cereal varieties investigated by the Agronomic Research Service in Morocco**).
Serv. Rech. Agron., Rabat 1955 : Pp. 104.

An alphabetical list is given of all varieties tested at the Rabat Experiment Station up to 1 January 1955 and of hybrids bred at the station from crosses between foreign varieties. The data provided comprise the name of the variety or hybrid, the number under which it is known at the station, the botanical variety to which it belongs and its country of origin. Both varieties of foreign provenance that have proved adapted to Moroccan conditions and those that have been rejected after trials at the station are listed.

1169 Grillot, G.
Blés irrigués. (**Irrigated wheats**).
Terre maroc. 1954 : No. 298 : 1–16.

This article is devoted primarily to a discussion of technical problems encountered in the irrigation of wheat fields. In recent trials carried out at a number of different centres in Morocco, the soft wheat Pinyte and the hard wheats Kyperounda and Bouteille [Bottle] were found to be among the varieties best adapted to cultivation under irrigated conditions. The soft wheats Florence x Aurore 2511 [Dawn 2511] and Seafoam also gave high yields in most localities but proved extremely sensitive to adverse environmental factors. The soft wheat Pusa x Mentana 10359 was also highly productive under irrigated conditions but suffered from the defect of being extremely susceptible to *Helminthosporium* sp.

1170 **New winter wheat varieties introduced in Indiana: to be released to certified seed growers this fall.**
What's New Crops Soils 1955 : **8** : No. 1 : p. 26.

Two new winter wheats, Dual and Vermillion, developed by the USDA and Purdue University Agricultural Experiment Station, are being released in Indiana. Dual, a midseason, beardless, white-chaffed variety adapted to Indiana, is resistant to Hessian fly, leaf rust, a soil-borne mosaic virus and powdery mildew. Vermillion resembles Knox in earliness, height and leaf-rust resistance but is more winter hardy and less susceptible to loose smut.

1171 Monstvilaĭte, Ja. I.
(The Mičurinists of the Lithuanian SSR).
Agrobiologija (Agrobiology) 1955 : No. 4 : 348–49. [Russian].

New varieties of winter wheat from Dotnuva, Pergale and Muras, notable for lodging resistance, and variety 564 (a hybrid between wheat and rye) characterized by high yield and large grain, are mentioned among recent achievements of Lithuanian plant breeders.

1172 Månsson, T.
Gräsmjöldagg, *Erysiphe graminis* DC., på vete. **(Powdery mildew, *E. graminis* DC, on wheat).**
Sverig. Utsädesfören Tidskr. 1955 : **65** : 220–41.

The distribution of *E. graminis* in Sweden, its economic importance and the effects of various environmental factors on the development of the fungus are discussed. Certain varietal differences in susceptibility to the pathogen were noted in the winter of 1953–54, a season in which conditions were especially propitious to the pathogen. Of the varieties widely grown in central and southern Sweden, Odin, Virtus and Aros were found to have a high degree of resistance; certain selected lines of Sv01543 (Eroica x Skandia II] and Eroica II also proved comparatively resistant. Heavy doses of nitrogen fertilizer were found to increase susceptibility to *E. graminis* and here again varietal differences were observed, Diamant II [Diamond II] and Sv01200 suffering less as the result of increases in the nitrogen level than varieties such as Pondus and Dala. In his concluding remarks the author stresses the importance of further breeding for resistance to powdery mildew in *Triticum vulgare* and suggests that interspecific crosses be effected with a view to transferring genes for resistance from *T. durum*, *T. persicum* and *T. timopheevi*.

1173 Kryžanovskiĭ, F. D.
(Wheat-*Agropyron* Hybrid 1).
Vestn. Akad. Nauk SSSR (Rec. Acad. Sci. USSR) 1955 : No. 5 : 49–51. [Russian].

Previous descriptions of this productive and lodging-resistant winter wheat (cf. *PBA*, Vol. XXV, Abst. 918) are amplified by a few additional details.

174 Favret, E. A. & Vallega, J.
Genética de la resistencia a *Erysiphe graminis* en trigo. **(Genetics of resistance to *E. graminis* in wheat).**
Rev. Invest. agríc. B. Aires 1954 : **8** : 105–10.

Earlier investigations having shown Axminster and Normandie to be the only wheats resistant to all three Argentine races of *E. graminis* var. *tritici* (cf. *PBA*, Vol. XIV, Abst. 514), a number of crosses using these varieties were made. In all crosses of resistant x susceptible varieties, resistance to race Arg. 1 behaved as a single dominant. Hybrids of Axminster x Normandie were all resistant and it is concluded that their resistance was dependent on the same dominant gene, which is designated Ml^a. Study of the reaction of the progenies to other diseases showed that Axminster carries also a gene for resistance to race 20 of *Puccinia rubigo-vera*, closely linked to Ml^a, and a separate gene for resistance to race 5 which proved to be slightly linked to that for resistance to race 20 but independent of the Lin Calel gene for resistance to race 5.

1175 Nakagawa, M.
(Studies on the resistance of wheat varieties to *Gibberella saubinetii*. II. Genetical factors affecting resistance to *G. saubinetii*).
Ikushugaku Zasshi/Jap. J. Breeding 1955 : **5** : 15–22. [Japanese].

From analyses of F_2 segregates of progenies of seven wheat crosses, it is inferred that resistance to the above pathogen is dependent on three dominant genes, *A*, *B*, *C*, epistatic to one another in the order given. The genotypes of the varieties used in the crosses are believed to be as follows: Saitama 27, *Abc*; Ejima 1, *aBc*; Wichita, *abC*; Shinchunaga [New Midlong], *ABc*, Norin [Ministry of Agriculture and Forestry] 26, *AbC*; Norin 50, *aBC*; and Norin 12, *abc*.

1176 Ohms, R. E. & Bever, W. M.
Types of seedling reaction of Kawvale and Wabash winter wheat to three physiologic races of *Ustilago tritici*.
Phytopathology 1955 : **45** : 513–16.

Ohms, R. E.
Pathological and morphological effects of *Ustilago tritici* (Pers) Rostr. on winter wheat.
Diss. Abstr. 1955 : **15** : Publ. No. 11,523 : 681–82. (Abst.).

In Kawvale, which is resistant to races 1, 3 and 11, inoculation of the seeds with any of these races gave seedlings in which the third internode tended to be reduced and the fourth abnormally elongated and in which the scutellum but not the growing point was infected. In Wabash, which shows seedling susceptibility to all three races, the fourth internode was generally not elongated and both scutellum and growing point were infected. The adult resistance of Wabash

to race 11, expressed as the percentage of smutted heads, appeared to be due to the death of infected plants at the seedling stage.

1177 Cenóz, H. P.
Resistencia al carbón volador del trigo. (**Resistance to loose smut of wheat**). Rev. Invest. agríc. B. Aires 1952 : **6** : 29–87.

The varieties Benvenuto Inca, Klein Cometa [Comet] and others which have recently gained in popularity are less resistant to loose smut than the older varieties previously grown in Argentina. Artificial infections with *Ustilago tritici* have been made on over 450 wheat varieties; the results are tabulated and show that the only Argentine variety displaying complete immunity during the five years of the test was Sinvalocho MA; several others with about 1% of attack were almost all descendants of 38MA. A number of wheats introduced from abroad were immune or highly resistant. Varieties of *Triticum durum* proved immune or highly resistant when tested with inoculum from bread wheat but are often attacked in the field. A comparison of the results in Argentina with those obtained in the USA suggests that the biotypes in the two countries are distinct.

1178 Syrovatskiĭ, S. G.
(**Winter wheat varieties from Stavropolj**).
Zemledelie (Agriculture) 1955 : No. 8 : 85–87. [Russian].

Hybrid 481, from (Illini Chief x Kanred 242253) x Hostianum 237, and Hybrid 343 (Ridit x Ukrainka) have recently been produced at the Stavropolj Breeding Station. The former yields 2·1 c. more per ha. than the standard Vorošilovskaja, shows good resistance to loose smut and is a strong wheat with large, 91% vitreous grain. Hybrid 343 is also more productive than Vorošilovskaja and does not lodge or shed grain.

1179 Ševčenko, F. P.
(**Intervarietal mass selection of spring wheat for resistance to loose smut**).
Zemledelie (Agriculture) 1955 : No. 8 : 73–76. [Russian].

At Barnaul, resistance to smut and other diseases in wheats has been improved by selection for large grain size and rate of germination. The improvements were heritable and were intensified by continuous selection. This method is preferred to selection of resistant families from among artificially infected material, as this is said to have deleterious effects upon heritable seed properties, notably yield. Resistance to smut can be further improved by sowing spring wheats for several generations in late autumn and by avoidance of late sowing in the spring.

1180 Fadergons, I. [Fadrhons, J.]
(**Breeding wheat for resistance to stinking smut**).
Za socialist. seljskohozjaĭstv. Nauk. (For socialist agric. Sci.), Praha 1955 : **4** : 142–55. [Russian].

The substance of this article is the same as that referred to in *PBA*, Vol. XXV, Abst. 2941.

1181 Kiričenko, F. G.
(**The winter wheat Odessa 16**).
Agrobiologija (Agrobiology) 1955 : No. 4 : 21–27. [Russian].

Odessa 16 was selected from Odessa 12 (Zemka x Hostianum 237) and is distinguished by resistance to smut, bunt, drought and lodging. In recent trials in the Ukrainian steppe it has outyielded the standard Odessa 3 which it surpasses in hardiness and tolerance of spring frosts. It ears 1–2 days earlier than Odessa 12. The baking quality is good.

1182 Zscheile, F. P.
Attempt to increase bunt expression in wheat by unusual inoculation methods.
Phytopathology 1955 : **45** : 480–84.

Unusual inoculation techniques caused an increase in bunt development on a susceptible variety but were without effect on resistant varieties.

1183 Kovács, A.
Kísérleti adatok és számítások a búza vörösrozsda-ellenállóságának jelentőségéről. (**Experimental data and calculations on the importance of leaf rust resistance in wheat**).
Növénytermelés 1953 : **2** : 53–62.

In experiments on 115 varieties at the Sopronhorpács Experiment Station, leaf rust resistance was positively correlated with grain yield and with 1000-grain weight. Grain yield showed a low positive correlation with 1000-grain weight but none with number of ears /m².

1184 Villanueva Novoa, R.
Los híbridos de trigo de la Estación Experimental Agrícola de La Molina y su valor para la agricultura peruana. (**The wheat hybrids of the La Molina Agricultural Experimental Station and their value for Peruvian agriculture**).
Inf. mens. Estac. exp. agríc. La Molina 1955 : **29** : No. 336 : 1–7.

The results of tests of 99 hybrid lines at altitudes varying from 48 to 3852 m. are presented; those

lines which proved most resistant to *Puccinia graminis* var. *tritici* (races 14, 15B and 17) are enumerated; some lines were resistant to both *P. glumarum* and *P. graminis* and others to *P. graminis* and *P. rubigo-vera* var. *tritici*. Certain lines are mentioned for their high baking quality. On the basis of the tests the variety recommended for altitudes up to 1500 m. is Marina (María Escobar x NA101); for altitudes up to 2200 m. Mariache (María Escobar x H44–Marquis), Helvia (María Escobar x H44–Marquis) and Yamalán (Reward–H44 x Rhodesian) are recommended and for 2200–4000 m. Neo Maribal (María Escobar x Baladi).

1185 Villanueva Novoa, R.
Herencia de la reación a "Oidium", roya de la hoja, roya del tallo y de otros caracteres, en el cruce de los trigos "María Escobar" e "Industrial Argentino". (**Inheritance of reaction to mildew, leaf rust, stem rust and other characters in the cross of the wheats María Escobar and Industrial Argentino**).
Bol. Estac. exp. agríc. La Molina 1955 : No. 59 : Pp. 30. (Mimeographed).

Resistance to *Erysiphe graminis* var. *tritici* in the parent Industrial Argentino seemed to be determined by two independent genes, the F_2 comprising 624 resistant and 449 susceptible plants, which conforms to a ratio of 9 : 7. The María Escobar parent was resistant to *Puccinia rubigo-vera* var. *tritici* and in the F_2 there were 678 susceptible : 395 resistant, suggesting the operation of two complementary factors for resistance, giving a ratio of 10 susceptible : 6 resistant. María Escobar is resistant to the old forms of race 15B of *P. graminis* var. *tritici* that existed in the coastal area of Peru prior to 1950 but susceptible to the new forms, to which Industrial Argentino is partially resistant. The F_2 contained 927 susceptible and 146 moderately resistant plants; this ratio is interpreted as the effect of two independent genes for resistance contributed by Industrial Argentino and an inhibitor contributed by María Escobar.

A certain number of dwarf plants appeared in the F_2, in the proportion 154 dwarf : 919 normal; this is interpreted on the basis of 2 complementary genes for dwarf habit and one inhibitor, all present in Industrial Argentino, which has produced dwarfs in crosses with other varieties too.

The light brown glumes and red grains of Industrial Argentino behaved as a simple dominant to the white of María Escobar; the apical awnlets of Industrial Argentino also behaved as a simple dominant to awns in María Escobar.

Slight correlations were observed between dwarfness and reaction to leaf and stem rust, all the other characters studied being inherited independently.

1186 Lelley, H.
Megfigyelések *Triticum aestivum* x *Triticum timopheevi* hibrideken. (**Observations on *T. aestivum* x *T. timopheevi* hybrids**).
Növénytermelés 1953 : **2** : 21–28.

At the Kompolt Experiment Station, Hungary, 11 F_1 hybrids of *T. aestivum* var. *erythrospermum* (♀) x *T. timopheevi* (♂) resembled the pollen parent in ear type, were intermediate between the parents in hairiness and showed marked heterosis in height, length of ear and number of fertile shoots per plant; the number of stunted spikelets per ear was smaller than in either parent. F_1 sterility was due to poor development of the pollen and indehiscence of the anthers. The hybrids were resistant to brown rust and moderately resistant to black rust. The F_2 and back-cross generations showed greater morphological variation and improved seed setting compared with the F_1 and included individuals with good black-rust resistance.

1187 Kiss, Á.
Triticum Timopheevi x *T. durum* keresztezések vizsgálata. (**Investigations on *T. timopheevi* x *T. durum* crosses**).
Növénytermelés 1953 : **2** : 213–26.

In work carried out at the Martonvásár Research Institute, Hungary, the ear of the F_1 of *T. timopheevi* x *T. durum* was intermediate in morphology between the parental types and all F_1 plants showed low fertility and some susceptibility to leaf and stem rust. Fertility improved and ear variation increased in subsequent generations. Of 432 F_2 plants tested, seven were fully rust resistant. The cross (*T. timopheevi* x *T. durum*) x *T. aestivum* has shown promise and the F_1 is being back-crossed to *T. aestivum*.

1188 Johnston, C. O. & Levine, M. N.
Fifth revision of the international register of physiologic races of *Puccinia rubigo-vera* (DC.) Wint. f. sp. *tritici* (Eriks.) Carleton = (*P. triticina* Erikss.).
Plant Dis. Reptr. 1955 : Suppl. No. 233 : 104–20.

The register gives (1) an analytical key for the identification of races 1–163 according to reactions of the eight differential varieties

Malakof, Hussar, Mediterranean, Democrat, Carina, Brevit, Webster and Loros of *Triticum vulgare*; and (2) tables providing (*a*) details of infection types developed by the differentials in response to races 1–163, (*b*) names of the authors of the original descriptions of all these races, together with information on places and years of discovery, and (*c*) authors and the culture numbers used by them for the new races here designated 133–163.

1189 Vasudeva, R. S., Lele, V. C. & Misra, D. P.
A new physiologic race of *Puccinia triticina* Eriks, in India.
Indian Phytopath. 1955 : **8** : p. 73.

A race differing from other Indian races by its capacity to attack the differential wheats Mediterranean and Democrat has been discovered. In types of infection on the various differentials it most closely resembles race 77.

1190 Green, G. J. & Johnson, T.
The reaction of foundation stock lines of Selkirk wheat to some physiologic races of wheat stem rust.
Canad. J. agric. Sci. 1955 : **35** : 323–28.

The 42 lines constituting the present foundation stock of Selkirk [(McMurachy x Exchange) x Redman[3]] fell into two groups, one of which resembled McMurachy in being less resistant than the other to race 56 at a high temperature, to 56A at a low temperature and to 139 at high and low temperatures; the resistance to these races in the second group is therefore thought to derive from Redman. All the Selkirk lines resembled McMurachy in being resistant to 17, 29, 48 and 15B and Redman in being resistant to 48A.

1191 Johnston, C. O. & Levine, M. N.
Physiologic races of the leaf rust of wheat in the United States in 1954.
Plant Dis. Reptr. 1955 : **39** : 643–46.

In collections of *Puccinia rubigo-vera* var. *tritici* received from 33 states in 1954, races 5, 11, 15, 35, 54, 58, 105, 122 and 126 were abundant and widely distributed, race 5 representing 26·2% of all the isolates.

1192 Silva, R. da, Silva, A. V. da & Rincon, R. P.
Levantamento de raças fisiológicas de *Puccinia graminis tritici* e *Puccinia rubigo-vera tritici*, no Brasil. (**Culture of physiological races of *P. graminis tritici* and *P. rubigo-vera tritici* in Brazil**).
Agros, Rio Grande do Sul 1955 : **8** : 18–32.

Collections made in the five years 1949–53 showed only races 11, 15 and 17 of *P. graminis* to be present, race 17 being the most prevalent. In *T. rubigo-vera* a number of races were present, including two new ones, 143 and 150; races 20, 77 and 31 were the most prevalent.

1193 Freitas, A. P. do C. e
Os métodos e os conceitos na diferenciação de *Puccinia rubigo-vera* f. sp. *tritici* (Erikss. & Henn.) Carl. [**Methods and concepts in the differentiation of *P. rubigo-vera* f. sp. *tritici* (Erikss. & Henn.) Carl.**].
Brotéria 1954 : **23** : 174–94.

The importance of adopting a uniform system of designating races of the above pathogen throughout the world is indicated. It is suggested that races be defined on the basis of their pathogenicity towards Mains's set of differential varieties and that any two distinguishable biotypes that behave similarly with respect to these differentials should be considered as subraces of a single race.

1194 Villanueva Novoa, R.
Ensayos preliminares para aumentar la producción de trigo en el Departamento de Cajamarca. (**Preliminary tests for improving the yield of wheat in the Cajamarca Department**).
Inf. Estac. agríc. La Molina 1955 : No. 94 : Pp. 24. (Mimeographed).

Biotype 15B–2P of *Puccinia graminis* var. *tritici*, the most aggressive of any known in America, is present throughout the Cajamarca area of Peru and observations are being made on the reaction to it of all the wheats in the world collection of the US Department of Agriculture; a list of the varieties and hybrids that have proved resistant to the local races of all three rust species comprises certain Peruvian and Mexican hybrids, some Frontana hybrids from Minnesota, six Ethiopian wheats, *Triticum persicum* var. *fuliginosum* from Italy and Khapli from India.

In tests of new hybrids the best yields have been obtained from Garnet x Kenya 58 at high altitudes and from some selections from María Escobar x H44-Marquis at medium altitudes.

1195 **Rust-resistant wheat developed.**
World Crops 1955 : **7** : p. 415.

North Dakota 1, bred at North Dakota State College, is resistant to stem rust race 15B, is of high milling and baking quality and has given a good field performance.

1196 Rojas Mendoza, E.
El trigo y la roya negra en el Perú. **(Wheat and black rust in Peru).**
Bol. Estac. exp. agríc. La Molina 1955 : No. 56 : Pp. 38. (Mimeographed).

An historical account is given of the biotypes of *Puccinia graminis* var. *tritici* in Peru and the development of wheats resistant to them. By the use of a modified set of differential hosts at least four subtypes of race 15B have been identified, as well as several of races 14 and 17; type 15B–2P resembles race 189 in that it requires high temperatures and attacks Khapli. The proportion of the different races present varies in different seasons of the year and in different areas of the country; in the south the racial composition resembles that in the neighbouring territory of Chile, whereas in the Cordillera region new races are, it seems, being produced by hybridization on various *Berberis* spp.
Several of the hybrids produced by the La Molina agricultural experimental station are resistant to race 15B–2P and data are given on the reaction of other varieties that may be useful as resistant parents.

1197 Villanueva Novoa, R.
Ensayos uniformes con trigos híbridos. **(Uniform tests with hybrid wheats).**
Inf. mens. Estac. exp. agríc. La Molina 1954 : Setiembre : 11–13. (Mimeographed).

The F_1 to F_{11} generations of a number of wheat crosses were tested in different parts of Peru for rust resistance; some of them proved completely resistant to yellow rust even at the highest altitudes where attacks are generally most severe. Some also displayed resistance to brown rust but the search for hybrids resistant to *Puccinia graminis* var. *tritici* has been complicated by the occurrence of a specially virulent race, 15B–2P, and only partially resistant hybrids have been found so far.

1198 Tomiyama, K.
(Studies on snow blight of cereals).
Hokkaido Nogyo Shikenjo Hokoku/Rep. Hokkaido agric. Exp. Sta. 1955 : No. 47 : Pp. 234. [Japanese].

The most serious causes of snow blight of winter wheat in Hokkaido are *Typhula incarnata*, *T. ishikariensis* and *Sclerotinia graminearum*. The nature of resistance to *T. incarnata* was investigated in the laboratory. The susceptibility of cut leaves appeared to be correlated with the degree of proteolysis which commences in the older leaves under snow cover and spreads subsequently to the younger leaves. On the other hand, the epidermis of the older leaves seems to be less penetrable by the fungal hyphae. Akasabishirazu [Free of Brown Rust] 1, Norin [Ministry of Agriculture and Forestry] 8 and Dawson 1 are resistant to both *Typhula* and *Sclerotinia*.

1199 Schramm, W.
Pesquisa de fontes de resistência a septoriose (*Septoria nodorum* Berk.) do trigo. **(Search for sources of resistance to *S. nodorum* Berk. of wheat).**
Agros, Rio Grande do Sul 1955 : **8** : 33–44.

Inoculations carried out on a large collection of wheat varieties showed the following Brazilian wheats to possess resistance: Beckman 2117–37, H–40–48–12, H–49–19, M–5 35, M–20–38 and Veadeiros. The varieties Carala, Currel, Gasta and Red Heart received from Argentina were also resistant.

1200 Refai, F. Y., Jones, E. T., & Miller, B. S.
Some biochemical factors involved in the resistance of the wheat plant to attack by the Hessian fly.
Cereal Chem. 1955 : **32** : 437–51.

Study of resistant and susceptible varieties revealed no correlation of reaction to Hessian fly with respiratory activity, H ion concentration of the cell sap and contents of protein, ash, cellulose, silica and trace elements. Hemicellulose content and shearing resistance of the stem were however positively correlated with resistance. Evidence was obtained suggesting that the larvae secrete hemicellulase as well as a substance blocking the activity of plant phosphorylase. Growth of the larvae is evidently prevented in resistant wheats by the toughness of the tissues due to the large amount of hemicellulose.

1201 Gallun, R. L.
Races of Hessian fly.
J. econ. Ent. 1955 : **48** : 608–09.

Three inbred races of Hessian fly (*Phytophaga destructor*) designated A, B and C, have been selected from a local population at Lafayette, Ind. The wheats Vigo, Michigan Amber and CI 12557 are susceptible to all three races. B and C are capable of developing on CI 12985 and A 39153A1–11–1–1 respectively; CI 12985 possesses the W8 type of resistance and A 39153A1–11–1–1 resistance derived from PI 94587. F_1 hybrids involving the three races are being tested for their ability to infest the

five above-mentioned varieties. Preliminary results suggest that the capacity of B and C to develop on CI 12985 and A 39153A1–11–1–1 respectively is recessive or hypostatic to the inability of A to infest these two wheats.

BUCKWHEAT

1202 Lucenko, A. M.
(Intervarietal open pollination of buckwheat).
Agrobiologija (Agrobiology) 1955 : No. 5 : 125–32. [Russian].

This account of experiments at Gorjkiĭ mentions yield increases obtained by restricted or unrestricted open pollination for a number of varieties, notably for Bogatyrj [Hero] and the local variety Vyksunskaja. Data showing improvements in yield and 1000-grain weight and a reduction in the percentage of empty seed of the two varieties are presented. Some related topics, such as mixed sowings and the relative value of the varieties as pollen parents are also discussed.

OATS

1203 Murphy, H. C.
Registration of oat varieties, XX.
Agron. J. 1955 : **47** : 535–38.

The following varieties, registered in the USA in 1955, are described: Alamo (cf. *PBA*, Vol. XXV, Abst. 1923), Cimarron (cf. *PBA*, Vol. XXV, Abst. 958), Seminole (cf. *PBA*, Vol. XXIV, Abst. 1901), Floriland (cf. *PBA*, Vol. XXIII, Abst. 1108) and Victorgrain (cf. *PBA*, Vol. XXIV, Abst. 268).

1204 Haver, 1956. **(Oats, 1956).**
Landbouwvoorlichting 12 : Bijl. 14; Ber. Rassenkeuze 1955 : No. 194 : Pp. 5.

The results of interprovincial trials conducted in the Netherlands in 1955 are reported and a brief description is given of each variety tested. On highly fertile soils Abed Minor and Pendek gave the highest yields of grain and Binder the highest yields of straw. The new variety CIV8976 also gave high yields of grain but was below the average of the other varieties in yield of straw; it is described as a short, stiff-strawed variety producing grain of exceptionally good quality. On dry sandy soils of low fertility Adelaar and the new variety MGH4 gave the highest yields of grain and Adelaar the highest yields of straw. MGH4 is described as a highly productive variety with rapid, luxuriant growth and long, lax straw. Marne, Libertas, Civena and Nestor (= CIV522) gave the best results on soils of medium fertility.

1205 Morey, D. D.
Sunland and Seminole, two new oats for Florida.
Circ. Fla. agric. Exp. Sta. 1953 : No. S–63 : Pp. 8.

A detailed account is given of Sunland [Fulghum (CI708)] x Landhafer] and Seminole [Appler x (Clinton[2] x Santa Fe)], already referred to in *PBA*, Vol. XXIV, Abst. 1901.

1206 Schlehuber, A. M.
Cimarron oats.
Bull. Okla. agric. Exp. Sta. 1955 : No. B–457 : 3–10.

The winter-hardy, early maturing oat Cimarron is described in detail (cf. *PBA*, Vol. XXV, Abst. 958).

1207 Bell, R. A. M. & Price, C. D.
N.A.A.S./N.I.A.B. Trials of winter oats varieties 1949-51.
J. nat. Inst. agric. Bot. 1955 : **7** : 297–302.

Details are given of the field characteristics and yield of S147 (control), Picton, S172 and Grey Winter in trials conducted in England and Wales. S147 was superior to the others in yield; S172 had the greatest resistance to lodging.

1208 Forsøg med havresorter 1949–54.
(Trials of oat varieties, 1949-54).
Tidsskr. Planteavl 1955 : **59** : 353–57.

Data are given on the grain and straw yields and resistance to lodging of 9 varieties tested on different soil types at 15 stations in Denmark. Data on preliminary trials of three further varieties are included.

1209 Ross, W. M.
Associations of morphological characters and earliness in oats.
Agron. J. 1955 : **47** : 453–57.

In fourteen oat varieties studied at the Illinois Agricultural Experiment Station in 1950–1, date of panicle initiation and date of heading were closely correlated. Earliness as determined from either of these dates was highly and positively correlated with number of internodes and with number of visible leaves at time of panicle initiation and highly and negatively correlated with peduncle length. The use of these characters in breeding for earliness is discussed.

1210 Ribeiro, M. A. M. do V.
Degenerescência da aveia? **(Degeneration of oats ?)**
XIII Congresso Luso-Espanhol para o Progresso das Ciências. (XIIIth Portuguese-Spanish Congress for the Advancement of Science) 1950 : **5** : 241–45.

The deterioration of *Avena sativa* varieties into

forms resembling *A. strigosa* when grown on poor soils in Portugal is found to be reversible and is not considered to be an hereditary phenomenon at all.

1211 Welsh, J. N.
Off-types in oats.
Cereal News 1955 : **2** : No. 3 : 11–14.

The characteristics of off types are briefly discussed in relation to theories concerning the origin of *Avena sativa*. Off types appearing in Garry, which involves two varieties of *A. byzantina* in its parentage, present a considerable problem. They are mainly due to chromosomal aberrations; the breeding behaviour of the several different types is to be determined.

1212 **Heat units measured as index to speed of ripening in oats.**
What's New Crops Soils 1955 : **8** : No. 1 : p. 25.

At Iowa State College, S. C. Wiggans found that among eight varieties studied early-maturing varieties required fewer heat units to reach maturity than midseason or late-maturing varieties, a heat unit being defined as "one degree Fahrenheit in the daily mean temperature required for growth". Within a variety, late-planted oats required fewer heat units than those planted in April or early May.

1213 Valle, O.
Leikkuupuinnin soveltuvuus kauran korjuuseen. (**The suitability of the combine harvester for harvesting oats**).
Siemenjulk. Hankkijan Kasvinjalos-Laitos Tammisto 1955 : 134–50.

The results of investigations on the use of combine harvesters for oats made by the Agricultural Research Centre at Tikkurila during 1952–54 are given. The principal varieties grown, Sisu, Tammi, Eho and Orion III are all suitable for combining. Data are given on the water content of the grain at time of harvesting and the effect of water content on subsequent germinability.

1214 Grafius, J. E., Brown, H. M. & Kiesling, R. L.
Stem-break in senescence in oats.
Agron. J. 1955 : **47** : 413–14.

The percentage of broken culms occurring in overmature stands at two nurseries at East Lansing, Mich., showed a highly significant negative correlation with resistance to lodging in the green state and with date of heading and a less significant positive correlation with incidence of *Septoria avenae*. The bearing of the results on selecting oats for suitability for combine harvesting is indicated.

1215 Griffiths, D. J.
The development of disease-resistant varieties of oats.
J. agric. Soc. Univ. Coll. Wales 1955 : **36** : 25–32.

Breeding for resistance to crown rust, powdery mildew, stem eelworm (*Ditylenchus dipsaci*) and root eelworm (*Heterodera major*) at the Welsh Plant Breeding Station is briefly surveyed.

1216 Simons, M. D. & Murphy, H. C.
A comparison of certain combinations of oat varieties as crown rust differentials.
Tech. Bull. US Dep. Agric. 1955 : No. 1112 : Pp. 22.

Studies were made of (1) the standard set of 13 oat differentials, comprising Ruakura, Green Russian, Hawkeye, Anthony, Sunrise, Victoria, Green Mountain, White Tartar, Appler, Sterisel, Belar, Bond and Glabrota; (2) a new set containing Anthony, Victoria, Appler, Bond, Landhafer, Santa Fe, Ukraine, Trispernia, Bondic and Saia and (3) the two sets combined, with a view to comparing the efficiency of the different sets in distinguishing between prevalent races of crown rust. In 1951, among 370 rust cultures collected from areas in the north-central, north-eastern and southern USA, the old set was able to distinguish 16 races, the new set 26 and the combined set 44. According to the ratios of number of races identified to number of varieties in a set, the new set was the most efficient and is recommended for future use in identifying rust races.

1217 Finkner, R. E., Atkins, R. E. & Murphy, H. C.
Inheritance of resistance to two races of crown rust in oats.
Iowa St. Coll. J. Sci. 1955 : **30** : 211–28.

A detailed account is given of a study of the genetics of resistance to races 57 and 109 in Clinton, Ukraine and Santa Fe. The investigations have already been referred to in *PBA*, Vol. XXV, Abst. 973.

1218 Vallega, J.
Variaciones en la población de *Puccinia graminis avenae* y sus consecuencias fitotécnicas. (**Variations in the population of *P. graminis avenae* and their consequences for plant breeding**).
Rev. Fac. Agron. B. Aires 1954 (1955) : **13** : 459–69.

The racial population reported in 1943 (cf. *PBA*, Vol. XIV, Abst. 1208) persisted until 1950,

when race 4 appeared in addition to 3 and 7. The new race, though highly virulent and capable of attacking Richland, White Tartar and their derivatives, had spread relatively slowly by 1951. Since race 7 attacks Joanette, the only promising source of resistance for Argentine plant breeders would seem to be Hajira which is resistant to both 4 and 7. A table of the reaction of oat varieties to races 3, 4 and 7 shows that resistant forms are mostly derivatives of Hajira.

1219 Frey, K. J. & Browning, J. A.
Mutations for stem rust resistance induced in oats by X-ray treatment.
Phytopathology 1955 : **45** : 490–92.

Of 61 mutants obtained at Iowa Agricultural Experiment Station as a result of X-irradiating seed of the oat variety Huron, 44 were resistant and three segregated for reaction to stem rust races 7 and 7A, six were resistant and eight segregated for reaction to race 8, and all were susceptible to race 6. The mutant gene in at least two of the lines resistant to 7 and 7A was identical with the Richland gene, while the gene carried by lines resistant to race 8 appeared to be the same as the White Tartar gene. Evidence of a previously unknown gene was found in a single line susceptible to 7A but segregating for reaction to race 7.

1220 Futrell, M. C. & Rivers, G. W.
The effect of temperature on the response of oats to race 216 of crown rust.
Plant Dis. Reptr. 1955 : **39** : 853–58.

Greenhouse tests were carried out at the Texas Agricultural Experiment Station to determine the reactions of 51 varieties and selections to race 216 of *Puccinia coronata* var. *avenae* at 65 and 85° F. A number of entries responded differently at the two temperatures, most varieties of Victoria parentage being more resistant at 65°. One of the most pronounced differences was that shown by CI6908 [(Arlington-Delair) x Trispernia], which was susceptible at 85° but highly resistant at 65° in January. In general, susceptibility tended to decrease in tests during February and March, when light intensities and day lengths were greater.

1221 Hadden, S. J. & Harrison, H. F.
Occurrence of oat mosaic in the lower coastal plain of South Carolina.
Plant Dis. Reptr. 1955 : **39** : 628–32.

Approximately a third of a group of 77 named varieties and unnamed selections of oats were rated as too susceptible to mosaic to be grown satisfactorily on infested soil. Most of the basic breeding lines carrying resistance to crown and stem rust are susceptible to mosaic, although reaction to the latter disease appears to be inherited independently of reaction to rusts and smuts. In breeding in South Carolina, segregating populations should be screened in early generations to eliminate mosaic-susceptible material.

RYE

1222 Bell, R. A. M. & Price, C. D.
N.A.A.S./N.I.A.B. trials of winter rye varieties : 1948-1951.
J. nat. Inst. agric. Bot. 1955 : **7** : 303–08.

Information is given on the performances of King II, Pearl, Petkus and an English land race in comparative trials at stations in England.

1223 Besnier, F.
Variedades interesantes de centeno. (**Interesting varieties of rye**).
Agricultura, Madr. 1955 : **24** : 461–63.

Reference is made to the various types of Petkus rye that now exist, to a number of other German varieties, to Swedish and to American varieties; most of these types are unsuitable for cultivation in Spain, being late, insufficiently resistant to drought and rust and slow in growth during the winter. Some Belgian ryes and certain early-maturing Petkus strains have done well and selected seed of these is being produced for growing in Spain.

1224 Price, S.
Irradiation and interspecific hybridization in *Secale*.
Genetics 1955 : **40** : 651–67.

Investigations on *Secale cereale* x *S. montanum*, already referred to in *PBA*, XXV, Abst. 2973, are described in detail.

1225 Jungfer, E.
Kurztagbehandelte Klone in der Roggenzüchtung. (**Short-day treatment of clones in rye breeding**).
Züchter 1955 : **25** : 255–62.

Rye from mid-May sowings was repeatedly divided in the first year to give 100–250 plants of identical genetic constitution from each seed. In the second year some of the plants from each clone were allowed to grow and produce seed in the normal manner, the remainder being subjected to an eight-hour photoperiod and repeatedly cut back to prevent flowering. On the basis of yield assessments made in the second year, crosses were effected between élite clones in the third year both under conditions of open pollination and between individual plants to ascertain differences between clones in

combining ability. The technique described is claimed to be an efficacious method of obviating many of the difficulties inherent in breeding for higher yield in a cross-pollinated crop such as rye and also to offer a means of producing inbred lines of rye, since crosses between different plants of the same clone can be effected more readily than self pollination of the same plant.

MAIZE

1226 Dadykin, V. P.
(At the Jakutia branch institute. Experiments on maize cultivation).
Vestn. Akad. Nauk SSSR (Rec. Acad. Sci. USSR) 1955 : No. 7 : 108–09. [Russian].
In trials in Jakutia conducted by the USSR Academy of Sciences, the late-maturing varieties Wisconsin 25 and Ivory King produced most forage and the early type Leningradka was superior in yield of ripe grain.

1227 Haas, J.
Nová slovenská odroda kukurice Bučianský konský zub. **(Bučiany Dent, a new Slovak maize variety).**
Pol'nohospodárstvo 1955 : **2** : No. 1 : 47–52.
The new variety is suitable both for grain production and silage. The grains are of the dent type. The vegetative period is 123–158 days. The yield of grain was 39·9 q. per ha. in in 1952 and 56·05 q. per ha. in 1953.

1228 Kosicyn, D. & Muromskiĭ, I.
(Experiments on growing maize in the Tambov province).
Kolhoz. Proizvod. (Collect. Fm. Prod.) 1955 : No. 12 : p. 23 : [Russian].
In recent trials Bukovina 2 has produced more grain and forage than any other early variety. Kabardinskaja Belaja Zubovidnaja [Kabarda White Dent] was the most productive among the late-maturing forage types. Voronež 76, North Dakota and Čakinskaja Žemčužina [Čakvi Pearl] were most suitable as seed parents for crosses under Tambov conditions and Harjkovskaja Belaja Zubovidnaja and Bukovina 2 as pollen parents.

1229 Celykovskiĭ, P. G.
(Maize growing in the Baškir ASSR).
Zemledelie (Agriculture) 1955 : No. 9 : 15–16. [Russian].
Mention is made of Čišmy 3 (Čišmy 1 x top-cross hybrid Dnepr 3) and Hybrid MB (Milovka x Bezenčuk 41), both from the Baškir Breeding Station. They are characterized by good grain yields under the climatic conditions of the Baškir ASSR.

1230 Ippolitova, L. V.
(Maize from Soviet Latvia).
Zemledelie (Agriculture) 1955 : No. 9 : 17–18. [Russian].
Reference is made to the new early-ripening varieties Punduris and Manalta. The former yields 40–50 c. grain and 200–250 c. green matter per ha.

1231 Butler, J.
What's new with open pollinate corn ?
Sth. Seedsman 1955 : **18** : No. 10 : 52–53.
The development of selected lines of open-pollinated varieties such as Mosby, Jarvis, Paymaster and Tenn Red Cob by the Fairview Seed Co., Ala., is described. Yellow Mosby has been selected from the white maize Mosby; except for its grain colour, it is similar to the parent variety.

1232 Coe, E. H.
Anthocyanin synthesis in maize, the interaction of A_2 and Pr in leuco-anthocyanin accumulation.
Genetics 1955 : **40** : p. 568. (Abst.)
"In the aleurone tissue of the corn kernel, the *Pr–pr* factor pair controls the level of hydroxylation of anthocyanin pigment, purple *Pr* kernels containing glycosides of cyanidin (penta-hydroxy), and red *pr* kernels containing glycosides of pelargonidin (tetrahydroxy). The differing hydroxyl group is that at the 3′ position on the B ring of the molecule. Aleurone tissue of colorless a_2 kernels contains a leucoanthocyanin which is converted to anthocyanin on heating a dilute acid-alcoholic extract of the tissue. The constitution of this anthocyanin is dependent upon *Pr* constitution, since extracts of a_2 *Pr* kernels give rise to cyanidin, while extracts of a_2 *pr* kernels give rise to pelargonidin. On the simplest assumption, it appears that the molecular difference controlled by *Pr–pr* is established rather early in the sequence of reactions leading to anthocyanin production."

1233 **Report of the Eighth FAO Hybrid Maize Meeting, Wageningen, Netherlands 7-12 February 1955.**
FAO UN, Rome 1955 : Pp. 68. (Mimeographed).
A survey by R. A. Silow, giving information on the progress made in the use of hybrids in Europe and the Mediterranean region during 1954, was followed by a discussion, opened by

L. Fenaroli, on the feeding value of hybrid maize. It was concluded that the higher yields of hybrids have resulted in increased production of protein per acre, although the protein content of the grain may be slightly less.

The results of the cooperative uniform tests carried out in the northern and southern regions to evaluate the performance of inbreds in hybrid combinations are summarized.

Plans were made for the permanent maintenance of European maize varieties as possible sources of valuable germplasm.

In the discussion on pests, E. Horber contributed a detailed survey of recent developments in maize breeding for resistance to insects in the USA.

On behalf of E. S. Bunting, L. A. Willey presented a paper on breeding for cold tolerance, with special reference to northern countries and techniques, pointing out that it is necessary to separate the disease aspects of the problem from actual ability to germinate and grow at low temperatures, and furthermore to distinguish between ability to germinate at low temperatures and capacity to grow under such conditions after emergence. F. J. Dijkhuis described experiments on cold tolerance at Wageningen, Netherlands. Referring to work in Jugoslavia, A. Tavčar mentioned that seeds containing purple plumules germinated better at low temperatures than those with white.

O. E. Nelson contributed an account of the control of cross-sterility reactions by the alleles *ga*, *Ga* and Ga^s, discussing the possible practical use of cross-sterile (Ga^sGa^s) stocks as a means of preventing contamination in hybrid seed production (cf. *PBA*, Vol. XXII, Abst. 2681 and Vol. XXIV, Abst. 1082).

1234 Becker, W. R.
Verslag van een excursie en besprekingen in noordwest-Duitsland van 16 t/m 19 September 1955 betreffende maisteelt en -veredeling. (**Report on a tour and discussions in northwest Germany from 16 to 19 September 1955 concerning maize cultivation and breeding**).
Gestencil. Meded. Cent. Inst. landbKund. Onderz., Wageningen 1955 : No. 19 : Pp. 6. (Mimeographed).

The author reports on impressions gained during a study tour of northwest Germany undertaken to obtain information on the breeding and cultivation of hybrid maize for silage in that area. Importance is being attached to the development of early-maturing varieties which, when cut, contain a high percentage of grain. Matador, CB45 and several other varieties of Dutch origin appear to meet these requirements. In addition, Matador and CB45 are resistant to lodging.

1235 Raddoppiata la produzione maidicola di Brescia. (**Maize yield doubled in Brescia**).
Agric. bresciano 1955 : **3** : No. 51 : p. 2.

Figures are given showing that 92% of the area under maize in the province of Brescia in northern Italy was sown with hybrid maize in 1955 and that the average yield of grain has risen from 34·39 c. per ha. in 1948 to 62·02 c. in 1955.

1236 Belaš, T. I.
(**An experiment on advancing maize cultivation towards the north**).
Agrobiologija (Agrobiology) 1955 : No. 4 : 37–41. [Russian].

Moscow 3 and Moscow 5, which produce good forage and grain yields under Moscow conditions, are briefly described. They are hybrid populations each comprising dents and flints. Moscow 3 is the earlier of the two and reaches full ripeness in September. Mention is also made of a new variety, Tuljskaja 9, notable for its earliness. Normally it produces many short stems but when crossed with Krasnodar Sterling it gives a tall progeny with single stems and large ears. Another large-eared hybrid was obtained by fertilizing the late large-grained southern dent Adžametskaja Belaja [White Adžametskaja] by mixed pollen of some early northern varieties. The hybrid has small yellow flint-type grain.

1237 Gluščenko, I. E.
(**Intervarietal hybrids of maize for districts new to its cultivation**).
Dokl. Akad. seljskohozjaĭstv. Nauk Lenin. (Proc. Lenin Acad. agric. Sc.) 1955 : No. 4 : 3–7. [Russian].

The data referred to in this paper have been summarized in Abst. 378.

1238 Galeev, G.
(**An experiment on seed production of hybrid maize on collective farms**).
Kolhoz. Proizvod. (Collect. Fm. Prod.) 1955 : No. 12 : 21–22. [Russian].

Hybrid maize grown in the Kubanj includes VIR 42 [Plant Industry 42], an F_1 hybrid between the inbred lines Slava [Glory] and Svetoč [Torch]. The seed of the parental forms was obtained from the regional state nursery.

1239 Kalinin, M. S.
(Using hybrid seed—an important reserve for increasing maize yield).
Dostižen. Nauk. pered. Opyt. Seljsk. Hozjaĭstv. (Achiev. Sci. progr. Exp. Agric.) 1955 : No. 5 : 22–26. [Russian].
The production of hybrid seed and heterosis in intervarietal, single-cross, double-cross and top-cross hybrids are discussed. VIR 156 [Plant Industry 156] and VIR 63 yielded the largest amounts of grain among the double-cross hybrids recently tested in the USSR. Krasnodar 4 was the most productive top-cross hybrid and Bukovina 1 the highest yielding intervarietal hybrid.

1240 Belizin, A. P.
(New promising varietal populations of maize).
Dokl. Akad. seljskohozjaĭstv. Nauk Lenin. (Proc. Lenin Acad. agric. Sci.) 1955 : No. 3 : 9–12. [Russian].
The data referred to in this article have been summarized in Abst. 379.

1241 Salamov, A. B. & Golik, L. A.
(The importance of external conditions in raising maize hybrids and their parental forms).
Dokl. Akad. seljskohozjaĭstv. Nauk Lenin. (Proc. Lenin Acad. agric. Sci.) 1955 : No. 3 : 3–8. [Russian].
Breeding work on maize in North Osetia and questions concerning the relationships between yield and provenance and between yield and different kinds of agronomic environment are discussed. The new hybrids H1528, H1589 and H1413, bred at the North Osetian breeding station, outyield the highly productive VIR 37 [Plant Industry 37] by 14·8 c., 15·3 c. and 13·6 c. per ha. respectively. H1413 was obtained by crossing an inbred line from North Osetia with another from the Institute of Plant Industry, and H1528 and H1589 are double crosses, each involving an inbred line selected from Chinese material.

1242 Bocanegra Salazar, S.
Mejoramiento del maíz en la Estación Experimental Agrícola de La Molina y sus resultados en la Costa Central del Perú. **(Improvement of maize at the La Molina Experimental Station and its results on the central coast of Peru).**
Inf. mens. Estac. exp. agríc. La Molina 1955 : **29** : No. 337 : 1–5.
The local yellow flint types of Peru have been collected and self pollination has been effected in a number of them, such as Santa Clara, Estrella [Star], Uhina Amarillo Cuzco [Cuzco Yellow Uhina] and Lurín Amarillo [Yellow Lurín]. From crosses of inbreds of Estrella and Uhina Amarillo Cuzco the hybrid La Molina 2 was produced; this has now been superseded by La Molina 3, from inbreds of Estrella and Santa Clara. This in the three years 1952–54 gave an average yield of 6800 kg. of grain per ha. compared with 5100 kg. from the standard variety Fumagalli and 6600 kg. from the best synthetic; it has exceeded Fumagalli by 20% in several of the coastal valleys of Peru; it is resistant to lodging and has yellow flint grain. Experiments aimed at the production of double-cross hybrids are now in progress.

1243 Galiano, L. J.
Comparativo de híbridos de maíz, variedades sintéticas y comerciales de marzo 1954–55. **(Comparison of hybrids, synthetic varieties and commercial varieties of maize from March 1954 to 1955).**
Inf. mens. Estac. exp. agríc. La Molina 1955 : **29** : No. 335 : 12–15. (Mimeographed).
The results of tests with a number of open-pollinated varieties, top crosses, single crosses and synthetics are presented. The highest yields were obtained from the top crosses, the best of which gave over 6500 kg. per ha.; top crosses LM2 and Cañete 2 also excelled in respect of grain quality. The synthetics have so far not been outstanding in yield but the best combination of yield and quality was found in LM Synthetic 5, which gave 5722 kg. of grain per ha.

1244 Miles, L. G.
Hybrid maize is pedigreed maize—but we must choose the right hybrid for the job.
Qd. agric. J. 1955 : **81** : 1–9.
An account of hybrid maize is given for the benefit of the farmer in Queensland; hybrids are recommended for the different districts.

1245 Kavanagh, L. R.
Maize—1955-56 sowing recommendations.
Agric. Gaz. NSW 1955 : **66** : 282–86.
Government certified hybrid-maize seed is now available for the first time in New South Wales. Descriptions of recommended hybrids are provided.

1246 Harada, K., Murakami, M., Fukushima, A. & Nakazima [Nakajima], M.
(Studies on the breeding of forage crops. I. Studies on intergeneric hybridization between *Zea* and *Coix*).
Saikyo Daigaku Gakujutsu Hokoku, Nogaku/Sci. Rep. Saikyo Univ., Agric. 1954 : No. 6 : 139–45. [Japanese].

F_1 hybrids were obtained from *Coix lachryma-jobi* var. *susutama* ♀ x maize ♂ but not from the reciprocal. Data are given on pollen-tube growth in self and cross, direct and reciprocal, pollinations of *Coix* and maize.

1247 Marić, M.
(A study of the effects of inbreeding and cross breeding on maize).
Zborn. Rad. poljoprivred. Fak./Rev. Res. Wk. Fac. Agric., Beograd 1955 : **3** : 67–84. [Serbian].

At the Institute of Genetics and Plant Selection, Belgrade, inbreeding caused reductions in plant height, stem thickness, length of tassel, number of internodes, fertility, number of ears per plant, the ratio grain weight to cob weight, yield and 1000 grain weight. Cross breeding produced effects of a contrary kind upon these characteristics but they were less noticeable than those of inbreeding. The highest degree of heterosis was observed in Flajšmanov Zuban [Fleischmann's Dent] x Rumski Zuban.

1248 Laughnan, J. R.
Intrachromosomal association between members of an adjacent serial duplication as a possible basis for the presumed gene mutations from A^b complexes.
Genetics 1955 : **40** : p. 580. (Abst.)

Reasons are given for regarding gene mutation or spontaneous loss of the β element as an unsatisfactory explanation of noncross-over α derivatives from A^b complexes (cf. *PBA*, Vol. XXVI, Abst. 390). It is instead suggested that such derivatives may be the result of intrachromosomal pairing and exchange between the two synaptically equivalent members of the A^b complex.

1249 Peterson, P. A.
Dosage effect on the mutability of a mutable pale green gene in maize.
Genetics 1955 : **40** : p. 589. (Abst.)

Two doses of *En* (enhancer) resulted in a considerably lower rate of mutation from pg^m to *Pg* than one dose (cf. *PBA*, Vol. XXIV, Abst. 1930). In this dosage effect, *En* resembles transposed *tr–Mp* (modulator), but differs from *Dt* (dotted) and *Ac* (activator), both of which bring about an increased rate of mutation with higher dosage.

1250 Mazoti, L. B.
Variación heredable espontánea en maíz.
(Spontaneous hereditary variation in maize).
Rev. Invest. agríc. B. Aires 1952 : **6** : 1–27.

A detailed account is given of the mutant reported previously (cf. *PBA*, Vol. XX, Abst. 281). The mutant is viviparous, the embryo being entirely free from dormancy, and even by drying immature grains it was not possible to arrest the embryo development; the mutant also has white endosperm and gives rise to albino seedlings; its genotype is assumed to be *y w vp*, all of which genes are on chromosome 5. The group proved to be independent of Y_1 in chromosome 6. Tests of linkage with other genes in chromosome 5 showed it to be very close to bm_1, a region which seems to be specially susceptible to variation, as shown by a number of mutants in the same area cited from other authors. In crosses with Standard Normal Stock the group *y w vp* behaved as a single unit and gave no signs of structural aberrations. Occasional cross-overs were observed however between *yw* and *vp* and this indicates that the mutant is not due to a single pleiotropic gene. The fact that several grains possessing the mutant group have had coloured aleurone shows that gene A_2, which is 6 units from bm_1, is not included in the affected region, which must therefore be very small. It is suggested that the group in question may have arisen by partial differentiation occurring within a small section of the chromosome that had previously undergone duplication.

1251 Singleton, W. R., & Caspar, A. L.
Effect of chronic gamma-radiation on somatic mutations in maize.
Genetics 1955 : **40** : 595–96. (Abst.)

Plants of genetic constitution P^{RR}/p were found at different distances from a Co^{60} source, the radiation received varying from 0·8 r. to 185 r. per day. Except at the higher dosages, at which no seed set was produced, an inverse relationship was found between seed set and amount of radiation. As shown by the frequencies of variegated, orange and trace mutants, the response to low and high dosages was different, linear relationship between mutation and level of radiation being found only at higher dosages. Most mutations occurred late in ear development, very few having sufficient phenotypic expression to be subjected to genetic test.

1252 Schwartz, D.
Mutations at the yg_2 locus in maize.
Genetics 1955 : **40** : 594–95. (Abst.)

The mutagenic effects of ionizing radiations upon the pseudoallelic series of chlorophyll markers on the short arm of chromosome 9 are being investigated. Locus yg_2 is located on the first chromomere, just proximal to the knob, and is closely linked on one side with *Wd* and on the other with *Py*. *Wd* Yg_2 *Py*/*wd df* plants, heterozygous for an irradiated (1000 r.) normal chromosome 9 and one deficient for the terminal six chromomeres, were scored for mutations at Yg_2, as shown by a yellow-green phenotype. Minute deficiencies which only lacked Yg_2 were indistinguishable from true gene mutations at the locus. The number of yellow-green mutants from the irradiated material did not show any significant increase over that occurring in the nonirradiated control.

1253 Mesa Bernal, D.
¿De dónde es originario el maíz?
(**Where did maize originate?**).
Agricultura trop. 1955 : **11** : 441–46; 681–89; 753–58; 807–15.

A number of references that could have applied to maize are cited from sources prior to the discovery of America; these include Pliny's description in the first century AD, ancient Chinese proverbs, verbal and pictorial records from the ancient civilizations of Persia and Syria, and Hindi designations for maize, e.g. kukri, which are apparently cognate with the Slav kukuruza. The theory of Stonor and Anderson (cf. *PBA*, Vol. XXI, Abst. 1009), and some criticisms of it, are also referred to briefly. In the second part the views of certain authors who defend the American origin of maize are examined, with extracts from the work of Mangelsdorf and Reeves (cf. *PBA*, Vol. X, Abst. 760) and of Wellhausen *et al.* (cf. *PBA*, Vol. XXIII, Abst. 1158). With regard to the respective merits of South America and Mexico-Guatemala as the primary centre of origin it is pointed out that both the number of primitive races and the total number of races are greater in South America.

The third part presents the views of several authors favouring an origin in Colombia, special mention being made of the Chococito [Choco maize] of Colombia which is almost identical with the Assam maizes; on the whole, however, the evidence in favour of Colombia is not regarded as very strong. Reference is also made to certain primitive maize types found in Venezuela, one of them being known as Erepa, which is thought to have given rise to the name *arepa* for the local maize bread.

The claims of the Incas are examined in part IV but it is concluded that Peru can have been only a centre of selection and not the centre of origin, since the wild relatives of maize are absent there. The main maize types found in Peru and Bolivia, which are described, are all starchy and are clearly the result of a long process of selection and not of hybridization with *Tripsacum* like those of Mexico and Central America. The maize found in aboriginal tombs in Chile is shown to have been a tunicate popcorn with short ears and dark-coloured grain.

1254 Dollinger, E. J.
Analysis of a mutable system in maize.
Genetics 1955 : **40** : p. 570. (Abst.).

In investigations on the effects of γ radiation, mutation was found to be controlled by a transposable dominant factor *Ma* (mutation activator). Duplication and transposition of *Ma* may give rise to two independently segregating *Ma* factors. Crossing of a plant possessing *Ma* and appropriate dominant factors with individual recessive testers for chromosomes 3, 5, 9 and 10 resulted in mutation, consisting chiefly of recessive mosaic phenotypes, in 60–100% of the *Ma* endosperms. Expression of mosaic phenotypes was dependent on dosage of the locus in question, the greater the number of dominant factors the lower being the frequency of mosaics, since a greater number of simultaneous events would be required for expression. Analysis of mosaics involving chromosome 9 revealed frequencies of mutation in the order $C > C\ Wx > Wx$, "plus some breakage-fusion bridge cycles among others". Similar analysis with respect to chromosome 5 indicated frequencies of mutation in the order of $A_2 > Pr > Bt$, "plus mosaics involving two or three loci." "Analysis of mutant sectors involving two or three loci indicates many may be accounted for by the induction of chromosome rings resulting from breakage at various points along chromosome 5. Analysis of early occurring mutation (large mosaic areas) indicate 50 to 80% may be accounted for by induction of chromosome rings." Possibly every chromosome may have a number of sites at which *Ma* can induce breakage, this breakage being more frequent near the chromosome ends.

1255 Fabergé, A. C.
Types of chromosome aberrations induced by ethylene oxide in maize.
Genetics 1955 : **40** : p. 571. (Abst.)

Pollen carrying the endosperm markers *I*, *Sh*,

Bz and *Wx* was treated with a mixture of 1 part of ethylene oxide to 20 parts of oxygen, and used to pollinate plants containing *C*, *sh*, *bz* and *wx*. Approximately 1% of the kernels had aberrations in the marked short arm of chromosome 9, this proportion being equivalent to about one-tenth of the frequency of aberrations which could be induced at the same level of sterility by radiation. The aberrations induced appeared to be similar in kind to those resulting from X irradiation.

1256 Emmerling, M. H.
A comparison of X-ray and ultraviolet effects on chromosomes of *Zea mays*.
Genetics 1955 : **40** : 697–714.

A detailed account is given of investigations which have already been referred to in *PBA*, Vol. XXV, Abst. 3032.

1257 Anderson, E. G., Kramer, H. H. & Longley, A. E.
Translocations in maize involving chromosome 4.
Genetics 1955 : **40** : 500–10.

Data are given on the linkage relationships of Ts_5 (tassel seed-5), *su* (sugary endosperm-1), *Tu* (tunicate ear) and gl_3 (glossy seedling-3) with 23 translocations involving chromosome 4, the approximate order of the translocations on the chromosome being indicated. The recombination values for *su* and the interchange points of ten further translocations are also reported. In heterozygous translocations, interchanges in the short arm between *su* and the centromere appear to have little effect in suppressing recombination between Ts_5 and *su* or between *Tu* and *su*, while interchanges in the *Tu*-centromere region markedly depress recombination between *Tu* and *su*. It is suggested that a region of some length lies between *su* and the centromere, in which little recombination occurs in normal stocks, so that interchanges in this region have little effect on recombination.

1258 Anderson, E. G. & Kramer, H. H. & Longley, A. E.
Translocations in maize involving chromosome 6.
Genetics 1955 : **40** : 531–38.

A table showing the cytologically determined positions of 46 interchanges involving chromosome 6 is presented and summaries are given of two-point and three-point linkage tests of 21 translocations and the genes *Y*, *Pl*, *sm* and *py*. The approximate order of 25 of the translocations is indicated. All translocations in the proximal half of the long arm gave low recombination values with *Y* and those between *Y* and *Pl* reduced the recombination between these two points, which are mapped at a distance of 31 units from each other, to 10 per cent.

1259 Varenik, I. P.
(Maize grains which have overwintered in the soil).
Priroda (Nature), Leningrad 1955 : No. 11 : 116–17. [Russian].

It is thought that material showing resistance to rotting when sown in moist cold soil may be obtained by selection among the progeny of some Sterling plants the ears of which overwintered in the soil at Krasnodar.

1260 Kodymskiĭ, I. A.
(The effect of low temperatures upon maize seed that has just commenced germination).
Agrobiologija (Agrobiology) 1955 : No. 5 : 133–35. [Russian].

At Ljvov, the yield of a number of maize hybrids was appreciably increased when seed that had just commenced germination was subjected to low temperatures before sowing for varied periods not exceeding 29 days. For instance, Bessarabka [Bessarabian] x Brown County gave a yield increase of 7·9 c. per ha. and Minnesota x North Dakota 7·8 c. per ha. The respective optimum periods for subjecting seed to low temperatures were 17 and 21 days.

1261 Robertson, D. S.
The genetics of vivipary in maize.
Genetics 1955 : **40** : 745–60.

Eight viviparous single-gene mutants are described. Besides influencing dormancy, all the genes concerned affect other characters, e.g. five of them interfere with carotenoid synthesis in the endosperm and seedlings and also prevent chlorophyll production. By means of tests involving translocations, seven of the genes were found to be situated as follows: vp_1, chromosome 3; vp_2, 5; vp_5 and vp_8, 1; vp_9, 7; *ps* (pink scutellum), 5; and w_3 (white-3), 2. Linkage relationships were determined for all seven genes.

1262 Manrique Chavez, A. & Grobman, A.
Duración de la receptividad de las espiguillas pistiladas del maíz y factores que la afectan. **(Duration of receptivity of the pistillate spikelets in maize and the factors that affect it).**
Agronomía, Lima 1955 : **20** : 50–58.

In experiments in which pollen was applied to stigmas of different ages, the best results were

obtained from pollinations effected four and five days after the emergence of the stigma, when sets of 65·55 and 69·59% respectively were obtained; after 20 days the set fell to 15·26%. Somewhat higher sets were produced when the initial pollination was followed by a second application of pollen at varying intervals, and when three separate pollinations were effected sets of up to 82·45% were produced; in this case the third pollination was performed ten days after the emergence of the stigma. The additional yield from supplementary pollination was not however so large as to make the operation economic.

Other factors which influenced the set of grain were temperature and humidity.

1263 Musiĭko, A. S. & Ključko, P. F.
(The new maize variety Odessa 10).
Agrobiologija (Agrobiology) 1955 : No. 4 : 42–46. [Russian].

At Odessa, Liming Kubanskiĭ [Kubanj Leaming], with the tassels left intact, was fertilized by mixed pollen of Dnepropetrovsk + Minnesota 13 Extra. The hybrid is highly productive of grain and forage. The ears ripen in September, 15–18 days earlier than the seed parent. The plants are up to 3 m. high and produce 2–3 ears each. The ear weighs 430 g. and the 1000-grain weight is 375–406 g. In recent trials it yielded appreciably more grain than the hybrids Odessa 1 and VIR 42 [Plant Industry 42] and excelled Odessa 4 and Bukovinskiĭ 1 in forage yield.

1264 Musiĭko, A. S.
(How the new maize variety Odessa 10 was developed).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) 1955 : Ser. biol. : No. 5 : 57–62. Russian].

This article is substantially the same as that referred to in Abst. 395.

1265 Emeljanov, I. E.
(New ideas on the production of hybrid maize seed in foreign countries).
Dostižen. Nauk. pered. Opyt. Seljsk. Hozjaĭstv. (Achiev. Sci. progr. Exp. Agric.) 1955 : No. 8 : 92–94. [Russian].

The use of pollen-sterile lines for producing hybrid maize in the USA is described.

1266 Everett, H. L. & Loesch, P. J.
Studies on the restoration of pollen production in cytoplasmic sterile maize.
Genetics 1955 : **40** : p. 571. (Abst.)

It is postulated that pollen sterility in certain stocks is controlled by an aberrant condition of the cytoplasm. The expression of this male sterility may be partly or completely prevented by the external environment, dominant genes or systemically-active chemical sprays.

1267 Edwardson, J. R.
The restoration of fertility to cytoplasmic male-sterile corn.
Agron. J. 1955 : **47** : 457–61.

Of 124 Mexican and South and Central American varieties tested, 59·6% contained genes able to restore fertility to the male-sterile line C106Ms. The results of most crosses indicated that the restoration of fertility was probably dependent on a single gene pair, *Msms* or *MsMs*, but in some populations it appeared possible, although unlikely, that two gene pairs were involved. There was evidence of the occurrence of modifying genes in Ecuador 1672. A low positive correlation ($r = 0{\cdot}37$) was found between the presence of fertility-restoring genes and the number of chromosomes with knobs. Tests with markers on eight of the ten chromosomes suggested a linkage between *Ms* and *Gl* on chromosome 7, with a recombination value of 39·1%. Lines with restored fertility showed no cytological differences from their male-sterile equivalents, but paper chromatographic experiments indicate that one or more aminoacids are present after the first meiotic division in fertile tassels which are absent in sterile tassels.

1268 Duvick, D. N.
Allelism and comparative genetics of fertility restoration in cytoplasmically pollen sterile maize.
Genetics 1955 : **40** : p. 570. (Abst.)

The Mexican open-pollinated variety Zapalote Chico and inbreds KY21, K55, WG3, BH2 and F5DD1 restore pollen fertility in WF9, a line with cytoplasmic male sterility derived from the "Texas" source. The five inbreds contained fertility-restorer (*FR*) genes which were in most cases allelic whereas most of the genes in Zapalote Chico were nonallelic to those of the inbreds. By crossing WF9 with each inbred and back-crossing plants with Texas cytoplasm, it was found that two dominant complementary genes were required for complete restoration of fertility. When the three lines WF9, K4 and C106, the two last-mentioned also possessing the Texas type of cytoplasm, were compared as recessive testers in combination with BH2 and KY21, back-cross data indicated that (1) WF9, K4 and C106 differed in the number, and possibly degree of recessiveness, of the loci involved in cytoplasmic pollen sterility, and (2)

BH2 and KY21, although appearing to carry allelic and approximately equal sets of dominant complementary *FR* genes with respect to WF9 and K4, differed in their power to restore fertility to C106. Possibly in BH2 one or more *FR* genes were present which were more dominant than their alleles in KY21. Comparisons of back-crosses grown during winter in Florida and summer in Iowa suggest that in most or all of the *FR* inbreds at least one major dominant gene is required for pollen restoration in any locality; if the environment is sufficiently conducive to pollen fertility only this gene is necessary, but if environmental conditions are less favourable one or more dominant complementary factors, in addition, are necessary for complete ♂ fertility.

1269 Joachim, G. S.
Studies on the inheritance of "reversed germ" in corn.
Genetics 1955 : **40** : 577–78. (Abst.)

Kernels in which the embryo was turned towards the base of the ear instead of the tip appeared in a Minnesota inbred. Data from the F_2 and back cross of one cross between the aberrant inbred and a normal line indicated that embryo reversal depended upon two recessive genes. In a cross with another normal line and the back cross, an additional and dominant factor for reversal was present. When the Minnesota line was crossed with another showing embryo reversal from Canada, the F_1 had normal kernels, indicating that the parents carried different genes for reversal.

1270 Sirks, M. J.
A genetical puzzle.
Acta bot. neerl. 1955 : **4** : 471–73.

Among a collection of maize ears bearing F_2 kernels which segregated in the ratio **9 : 3 : 3 : 1** for *C* (chromosome 9) and su_1 (chromosome 4), governing the production of blue endosperm and smooth seeds respectively, one exceptional ear was found in which the lower two thirds of the cob bore a high proportion of smooth blue kernels (double dominant) and only a few kernels of each of the other gene combinations, while the upper third bore numerous yellow wrinkled seeds (double recessive) and a few of the other types. It is suggested that the apparent linkage between the *Cc* and Su_1su_1 loci might have been caused by a translocation between chromosomes 4 and 9 in the pollen parent. No satisfactory explanation is offered for the mosaic distribution of the different seed types on the cob.

1271 Teas, H. J., Anderson, E. G. & Cameron, J. W.
Roles of embryo and endosperm in determining niacin content of starchy and sugary maize endosperms.
Plant Physiol. 1955 : **30** : 334–37.

Sugary endosperms (*su*) weighed 32% less than starchy endosperms (*Su*) and contained nearly twice as much niacin, while the weights and niacin contents of the respective *su* and *Su* embryos were nearly equal. Niacin content of the endosperm was independent of the genotype of the embryo.

1272 Avila, A.
Estudio sobre contenido de caroteno y triptofano en maíces comerciales. (**Study on the content of carotene and tryptophane in commercial maizes**).
Rev. Invest. agríc. B. Aires 1952 : **6** : 417–23.

Analyses of 11 samples showed significant differences between varieties in respect of carotene content, the highest being in Colorado Klein with 8·00 γ/g. and the lowest in the hybrid Cargil 250A with 1·62γ/g. The yellow dent varieties were all lower than the coloured flints. No significant differences in tryptophane content were noted.

1273 Schaaf, H. M.
The effect of environment and genetic constitution on low temperature germination in corn.
Abstr. doct. Diss. Pa. St. Coll. 1954 (1955) : **17** : 92–94.

In the cold-test technique employed, samples of 25 kernels were planted on layers of field soil subject to different sequences and periods of temperatures of 10° and 25° C., stand counts providing the most efficient method of evaluating reaction. In general, single-cross seed gave higher counts than selfed seed of the parents. No relationship was detected between the performance of lines as males and their behaviour as females in single crosses. The reaction of seed from plots fertilized with different combinations of N, P and K provided no conclusive evidence concerning the effects of fertilizers upon cold-test behaviour. Temperature sequence did not exert any marked effect. No satisfactory genetical explanation of interactions between back cross and soil source occurring within groups of back crosses representing given pairs of inbred parents could be offered. An hypothesis of interaction between genotype and cytoplasm accounted for differences in cold-test reaction among groups of

back crosses having reciprocal single crosses as ♀ parents.

First Annual Report of the West African Maize Rust Research Unit, 1953 : Pp. 48.

1274 *Stanton, W. R. & Cammack, R. H. Sources of resistance to the maize rust* Puccinia polysora *Underw.* (*pp. 10–15*).

An account is given of methods tried out for the evaluation of the reaction of maize types to *P. polysora* at the above research unit, Ibadan, Nigeria. Grading on the basis of pustule development in the field has proved satisfactory. Varieties from the New World have been classified as resistant but African and Asiatic types have proved to be susceptible (cf. *PBA*, Vol. XXIV, Abst. 311).

1275 *Cammack, R. H. Observations on* Puccinia polysora *Underw. in West Africa.* (*pp. 16–31*).

Various aspects of the sudden spread of the disease in recent years are discussed.

1276 *Stanton, W. R. Factors affecting the yield of maize in West Africa.* (*pp. 32–40*).

The value of different characters as means of obtaining higher yields under West African conditions by breeding is examined in the light of the results of a variety trial carried out at Ibadan in 1953.

Appendix IV gives notes on the characters of 20 selected lines.

1277 Saccas, A. M.

La rouille américaine du maïs (*Zea mays* L.) due à *Puccinia polysora* Underw. au Cameroun et en Afrique équatoriale française. [**The American rust of maize (*Z. mays* L.) caused by *P. polysora* Underw. in the Cameroons and French Equatorial Africa**].

Agronomie Tropicale 1955 : **10** : 499–522.

A brief mention of varietal differences in susceptibility to *P. polysora* is included. At the Boukoko Station, French Equatorial Africa, Yangambi 120 proved fairly resistant; all the American hybrids tested were highly susceptible.

1278 Le Conte, J.

La lutte génétique contre la rouille américaine du maïs (*Puccinia polysora* Underw.) menée à Niaouli (Dahomey). [**The genetical struggle against American maize rust (*P. polysora* Underw.) conducted at Niaouli (Dahomey)**].

Riz et Rizic. 1955 : **1** : 153–58.

Current work on breeding for resistance to *P. polysora* at the Niaouli station, French West Africa, is reviewed. Four main lines of approach are being tried, viz. crossing susceptible local varieties with resistant and semiresistant foreign varieties, mainly of American origin; hybridization between semiresistant or tolerant local strains; pedigree selection of local varieties; and recurrent selection of illegitimate families obtained from open pollination of semiresistant inbred lines. Of the four techniques essayed, hybridization with foreign varieties, e.g. Capetown, Venezuela III, V520, U72, Big Joe and Tsolo, has given the best results. By back crossing the F_1 hybrids to the local varieties used it was possible to obtain strains morphologically identical to the local forms but possessing improved resistance to *P. polysora* and giving yields 17–38% higher than the indigenous varieties. The other three methods, which are aimed at producing tolerant rather than resistant strains, have also given promising results.

BARLEY

1279 Zomergerst, 1956. (**Spring barley, 1956**).

Landbouwvoorlichting 12 : Bijl. 13; Ber. Rassenkeuze 1955 : No. 193 : unpaginated.

The results are presented of trials of 22 varieties at different centres and on different types of soil in the Netherlands in 1955. Of the malting varieties Piroline gave the highest yields of grain and straw on all types of soil but the quality of its grain was inferior to that of Balder, the variety most widely grown in the Netherlands. Of the fodder varieties Herta gave the highest yields of grain on clay soils and Frisia and Herta the highest yields on sandy or loamy soils. Mansholt's tweerijige [Mansholt's two-rowed] gave the highest yields of straw but its grain yield was below the average of the other varieties tested. The English variety Proctor (cf. *PBA*, Vol. XXIII, Abst. 1180) has given highly satisfactory results in preliminary trials on clay soils in the Netherlands.

1280 Johnson, I. J.

Registration of barley varieties, XIII.

Agron. J. 1955 : **47** : p. 532.

The barley variety Cordova, registered in the USA in 1955, is described (cf. *PBA*, Vol. XXIII, Abst. 1956).

1281 **Report of the seed propagation division, 1952.**

J. Dep. Agric. Éire 1953–54 : **50** : 196–216.

This report gives an account of methods of pedigree seed propagation and includes details of large and small-scale trials of established

barley varieties and selections from Spratt-Archer x Kenia.

1282 Bell, G. D. H.
An achievement in plant breeding.
Discovery 1955 : **16** : 467–70.

A popular survey is given of barley breeding in England, particular reference being made to the recently developed varieties Proctor (cf. *PBA*, Vol. XXIII, Abst. 1180), Provost and Maythorpe (cf. Abst. 1283). Mention is also made of progress in the production of radiation-induced mutants and their use in breeding.

1283 Morris, G. P.
Descriptions of barley varieties.
J. nat. Inst. agric. Bot. 1955 : **7** : 318–19.

Maythorpe (Irish Goldthorpe x Maja) and Provost (Kenia x Spratt-Archer) have been added to the list of varieties provisionally recommended by the National Institute of Agricultural Botany. Both are higher-yielding than Kenia, resistant to lodging and of high malting quality, Maythorpe being slightly earlier in maturity than Kenia and Provost later.

1284 Kivi, E. I.
Pirkkaohra. (**Pirkka barley**).
Siemenjulk. Hankkijan Kasvinjalos-Laitos Tammisto 1955 : 115–18.

This six-rowed barley variety, released in 1952, is a line selected from a cross between 04369 (Maskin [Machine] x a Tammisto land race) and 05864, a strain of unknown origin. It is particularly suitable for cultivation in central Finland as it thrives on acid soils. Comparative data for Tammi, Pirkka and Balder are given, Pirkka having a slightly lower yield than Tammi, slightly longer growing season and somewhat weaker straw. The grain and malting properties are good.

1285 Kivi, E. I.
Ohran jalostus Tammistossa. (**Barley breeding at Tammisto**).
Siemenjulk. Hankkijan Kasvinjalos-Laitos Tammisto 1955 : 123–33.

A report is given on the aims, methods and results of barley breeding at Tammisto. Brief descriptions of the principal varieties are given; the principal six-rowed barleys are Lappi [Lapp], Olli, Perttu, Lappi II, Tammi and Pirkka; the two-rowed varieties include Piikkiö [Barbed], Uurainen, Halikko I and II, Louhi [Rock] and Helmi [Pearl].

1286 Forsøg med bygsorter 1951–1954.
(**Trials of barley varieties, 1951-54**).
Tidsskr. Planteavl 1955 : **59** : 345–48.

The subject matter of this report has been summarized in *PBA*, Vol. XXV, Abst. 1995.

Progress report of the Midwest Barley Improvement Association given at the Annual Meeting held at Milwaukee, Wisconsin 1954 : Pp. 88. (Mimeographed).

1287 *Progress reports on barley research in six of the seven Midwest states.* (*pp. 30–43*).

Of three selections retained at North Dakota from the cross Kindred x Titan, the most promising, B103, resembles Kindred in disease reaction, but has stronger straw and gives higher yields; it has satisfactory malting quality but tends to produce a low percentage of plump kernels. Back crosses of Kindred x Titan to Kindred yielded no outstanding lines. Strong-strawed strains of good quality have been obtained from Vantage x Kindred back crossed to Kindred. Four lines from Kindred x CI7117–77 have shown promise in yield trials, being almost free from leaf spotting. B103 and related lines have been crossed with types showing resistance to *Helminthosporium sativum*. A male-sterile type and other mutants have been produced by subjecting Kindred to ionizing radiation. A true-breeding mutant with white seedling leaves gradually becoming green has resulted from irradiating B103 and may be of use in studying leaf diseases. Work on the study of stem-rust resistance continued. B103 and related types have been crossed to the University of Manitoba lines 570 and 43–856–5, both of which have fairly strong straw, are stem-rust resistant and have plump kernels of high protein content.

At the University of Minnesota progenies of X-irradiated Kindred seed are being studied with a view to selecting for strong straw. An attempt is being made to transfer the gene *v* determining the six-rowed character from Kindred and Montcalm to the Swedish two-rowed barley Rika. The F_2 progenies of Minn. I–48–5 x Ia. 5286 and University of Manitoba 570 x Iowa 5286 showed promise in respect of spot blotch resistance. The loose-smut resistance of Anoidium is being introduced into Montcalm and Kindred.

At South Dakota State College, numerous hybrid selections have been tested with a view to finding high-yielding malting barleys adapted to eastern and north-eastern sections of the state. At Michigan State College, SD1776 and SD1761 have done well in yield and malting tests.

At Iowa State College selection for smut-resistant lines in hybrid combinations involving Trebi and Anoidium is in progress. Greater straw strength and kernel size are being added to CI9539 (Manchuria x Chevron), a selection

with outstanding resistance to stem rust and some other diseases. X_1 and X_2 populations of Kindred, Pillsbury and CI9539 are being examined for stiff-strawed types. The inheritance of smooth awns in Michigan Selection 832–1188 is under investigation.
Variety trials and selection continued at the University of Illinois.

1288 *Progress report on promising new selections of malting barley.* (*pp. 44–45*).
The varieties ND B103 and University of Manitoba 570 (see above) are described. Six Odessa selections with white aleurone show promise. Minn. I–48–5, a selection from Brandon 1136 [(Newal x Peatland) x OAC21], is a smooth-awned type with white aleurone and has performed satisfactorily in yield and malting tests.

1289 *North European varieties of two-rowed barley.* (*pp. 49–55*).
Descriptions are given of one Netherlands, one English and twelve Scandinavian barleys.

1290 *Malting quality of European barley varieties.* (*pp. 56–59*).
Notes on the malting quality of important European barleys, compiled from a recent publication by P. Bergal and F. R. Horne (cf. *PBA*, Vol. XXV, p. 272), are presented.

1291 *Experimental malting tests of barley varieties and selections.* (*pp. 60–67*).
Information is provided on the results of tests of varieties and selections at stations in Minnesota, North Dakota, South Dakota, Wisconsin, California, Oregon, Washington and Canada.

Report of the Barley Improvement Conference held at Schroeder Hotel, Milwaukee, Wisconsin, Monday, January 24, 1955 : Pp. 77. (Mimeographed).
The following papers of interest to breeders were read at the conference.

1292 *Shands, R. G. Testing and breeding of barley varieties in Wisconsin.* (*pp. 3–7*).
Of six varieties tested at seven stations in Wisconsin over the period 1949–54, the hybrid line X330–5 gave the highest yield. During 1952–54, four experimental hybrids tested at the same localities gave higher yields than five commercial varieties. The hybrids all had good straw strength but each had one or more disadvantages.
Pedigree and back-cross methods have been used in breeding for resistance to fungous diseases. Selection for stiff straw is being carried out in the crosses Moore x Manchuria and Moore x Kindred and their back crosses to each parent. Kindred has been used as the recurring parent in crosses and back crosses to Fort and stiff-strawed hybrid lines. From a population in which stem-rust resistance was linked with loose-smut susceptibility, a cross-over line, Valentine, combining resistance to both diseases, has been obtained. A study of hybrids between the net-blotch susceptible variety Moore and the resistant line Manchuria indicated that resistance is determined by two dominant genes, of which the one conferring a lower degree of resistance was linked with the lax-headed character, with a crossing-over value of less than 1%. A significant association has been observed between smooth awns and poor hull colour. It is thought that percolation of water into the leaf sheath during emergence of the head may be the cause of discoloration and may be hindered by the presence of barbs on the awns. Since dense-headed barleys also tend to accumulate water in the sheath, it is suggested that, for humid regions, it may be desirable to breed rough-awned, lax-headed malting barleys.

1293 *Hunt, L. A. Malt Research Institute.* (*pp. 22–27*).
The history and activities of the Malt Research Institute, Madison, Wis., are briefly described. The Institute is concerned chiefly with testing varieties for malting and brewing quality.

1294 *Bendelow, V. M. Some observations on malting barley in Europe, 1954.* (*pp. 29–35*).
Breeding of malting barley in Europe is briefly surveyed, particular attention being given to the importance of Scandinavian varieties in breeding programmes in western Europe and to the development of new barleys in Germany since 1945.

1295 *Wiebe, G. A. Report on yields and agronomic characters of barley varieties in Upper Mississippi Valley Uniform Nurseries, 1954.* (*pp. 36–41*).
Details are given of the performances of 19 six-rowed and five two-rowed varieties in trials conducted at 16 stations in the USA and three stations in Canada.

1296 *Dickson, A. D. Report on experimental malting tests of barley varieties grown in Mississippi Valley Nursery in 1954, including promising selections.* (*pp. 42–49*).
Information is provided on the kernel weight

and size and the malting quality of 18 barleys grown at 17 stations in the Upper Mississippi valley.

1297 *Burkhart, B. A. Pilot brewing evaluations of barleys grown in 1953.* (*pp. 50–54*).
The malting and brewing quality of barleys grown at five stations in North Dakota, Minnesota, Wisconsin, Oregon and Idaho is discussed, the detailed results of trials at each station being presented in table form.

1298 Sierra, J. A. & Rico Mejía, E.
Mejoramiento de las cebadas en Colombia. (**Improvement of barleys in Colombia**).
Agricultura trop. 1955 : **11** : 435–40.
In continuation of the previous article (cf. Abst. 409), it is reported that specimens of the barleys cultivated locally have been collected in all parts of the country and by selection from one of them the improved variety Funza has been produced; it is tolerant of a wide range of growth conditions and has outyielded standard varieties such as Pocha and Raspa by up to 30%, being at the same time earlier and good in malting and brewing quality. A large collection of foreign barleys is also maintained; some of the varieties possessed of characters useful for breeding, such as early maturity, standing capacity, disease resistance or quality, are indicated. Line PI 5649 from the USA is being used as a parent in breeding for higher content of β-amylase.

1299 Robertson, D. W., Wiebe, G. A. & Shands, R. G.
A summary of linkage studies in barley: supplement II, 1947-1953.
Agron. J. 1955 : **47** : 418–25.
As in previous summaries (cf. *PBA*, Vol. XI, Abst. 708 and Vol. XVII, Abst. 1646), tables are provided showing (1) new symbols allotted since 1946 to genetic characters, (2) linkages and associations not previously reported, (3) miscellaneous linked factor pairs and (4) independently inherited factor pairs reported between 1946 and 1953.

1300 Kivi, E. I.
Mutaatiot kasvinjalostudsen palveluksessa. (**The utilization of mutations in plant breeding**).
Maatalous ja Koetoiminta 1954 : **8** : 54–60.
A brief review of the possibilities of mutation in plant breeding is given. Of mutations induced at the Tammisto Plant Breeding Station, those in the barley varieties Tammi and Rigel are briefly mentioned. The best of the Tammi mutants is the line a8514, with a 1000-grain weight 1·5 g. greater than Tammi. A mutant of Rigel has been produced, distinguished by the light green colour of its leaves.

1301 Lawrence, T.
The production of mutations by the irradiation of Montcalm barley.
Canad. J. Bot. 1955 : **33** : 515–30.
In experiments at the University of Alberta, seeds were exposed to radiation from an X-ray source (201 r./min.), a betatron (181·8 r./min.), radium-beryllium (5·3 r./min.) and Co^{60} (4·5 and 75·75 r./min.), the dosage in each case being 10,000 r. None of the last four sources of radiation was more effective in inducing mutants than X irradiation; betatron treatment and exposure to Co^{60} at the high rate of dosage were in fact less effective. Over 30 types of X_2 mutants were obtained, including stiff-strawed and early-maturing variants which appear to be promising as new varieties but require further evaluation. Attention is drawn to some advantages of the induction of mutations over the usual methods of breeding.

1302 Nybom, N.
The pigment characteristics of chlorophyll mutations in barley.
Hereditas, Lund 1955 : **41** : 483–98.
The rules used to classify chlorophyll mutations induced in barley and the methods employed to determine their pigment composition at the Institute of Genetics, Lund, Sweden, are described. A reflection-photometric technique has proved to be more satisfactory than extraction-photometric analysis. Attention is drawn to the role of environmental factors in influencing pigment characteristics. The majority of mutants displayed marked differences in composition when grown at 12° and 21° C.

1303 Gelin, O. E. V.
The cytological effect of different seed treatments in X-rayed barley.
US Atom. Energy Comm. 1953 : p. 321. (Abst.).
The reaction of the chromosomes of the barley Golden to X irradiation depended upon the physiological condition of the seeds. Irradiation of seeds (1) containing 10% water, (2) with 15% water, (3) presoaked in distilled water and (4) pretreated with 0·01% heteroauxin solution resulted in 12·66, 27·99, 53·80 and 50·99% disturbances respectively, the cells first entering into division showing the highest frequency of aberrations. A marked parallelism was found

between sterility, mutation rate and frequency of cells with chromosomal irregularities.

1304 Caldecott, R. S.
Protection from X-ray induced injury by hydration.
Genetics 1955 : **40** : p. 565. (Abst.)
Sensitivity of barley seeds to X rays, as measured by inhibition of seedling growth and frequency of chromosomal aberrations, decreased as the water content of the embryo increased from 4 to 8%; raising the water content up to 60% did not result in any further modification of sensitivity, provided cellular activity was inhibited by low temperature.

1305 Nilan, R. A.
Post-radiation storage effect on chromosomes in barley seeds X-rayed at normally ineffective dosages.
Genetics 1955 : **40** : p. 588. (Abst.)
The frequencies of chromosomal bridges and acentric fragments were determined in the shoot-tip cells of seeds immediately after irradiation with 45 r. or 90 r., and 6, 12 and 16 weeks after storage. The aberration frequency in the treated seeds examined immediately was not significantly higher than in nonstored seeds. Storage did not affect the number of aberrations in nonirradiated seeds. After storage for 6 weeks the frequency of aberrations increased appreciably in seeds treated with either dosage, further increases being obtained with longer storage. The frequencies were higher in irradiated seeds stored in oxygen than in air.

1306 Yamamoto, T.
(Studies on sterility in barley. V. Determination of the force involved in the dehiscence of the anther).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1955 : **23** : p. 241.
A fuller version of this paper was summarized in *PBA*, Vol. XXV, Abst. 3058.

1307 Blum, P. H.
The identification by kernel characteristics of malting barley varieties grown in the United States.
Amer. Brewer 1954 : **87** : No. 12 : 41–44.
Descriptions and diagrams are provided of the kernels of the two-rowed barleys Hannchen-Hanna, Compana and Moravian, and the six-rowed varieties Atlas, Winter Tennessee, Oderbrucker, OAC21, Wis.38, Kindred, Montcalm, Odessa and Tregal. It is emphasized that the descriptions apply only to well-filled representative grains from regions where the variety in question is commonly grown.

1308 Arny, D. C. & Leben, C.
The effect of the water-soak seed treatment on the germination of certain barley varieties grown at different locations.
Phytopathology 1955 : **45** : 518–19.
Control of loose smut by soaking and then drying the grain prior to sowing had an adverse effect on the germination of seven varieties tested at 16 localities in the upper Mississippi valley. Wisconsin Barbless suffered least damage from soaking and Kindred most.

1309 Kraevoĭ, S. Ja.
(Interspecific and intraspecific competition in the genus *Hordeum*).
Bjull. Mosk. Obšč. Ispyt. Prirod. (Bull. Moscow Soc. Nat.) 1955 : **60** : 77–79. [Russian].
Data from the Institute of Genetics on competition between (1) *H. spontaneum* and *H. sativum* var. *nutans*, (2) *H. sativum* var. *nutans* and *H. sativum* var. *pallidum* and (3) two cultivated varieties of *H. sativum* var. *medicum*, namely Medicum 046 and Medicum 026, are presented. In each case the first mentioned component suppressed the other, the competition being most acute in the first case and least in the last.

1310 Schaller, C. W. & Briggs, F. N.
Inheritance of resistance to mildew, *Erysiphe graminis hordei*, in the barley variety, Black Russian.
Genetics 1955 : **40** : 421–28.
Resistance of Black Russian to race 3 of *E. graminis* var. *hordei* was conditioned by a single gene, Ml_{a2}, which appeared to be allelic to the gene Ml_a governing resistance in Algerian. Evidence was obtained that these alleles and three other genes out of the ten now known to affect resistance to race 3 (cf. *PBA*, Vol. XI, Abst. 997 and Vol. XIX, Abst. 1805) are arranged in linkage group II in the order Ml_k–Ml_a–Ml_d–Ml_p.

1311 Hiura, U. & Heta, H.
Studies on the disease-resistance in barley. III. Further studies on the physiologic races of *Erysiphe graminis hordei* in Japan.
Ber. Ōhara Inst. 1955 : **10** : 135–52.
Eleven physiological races, designated I to XI, have now been detected in Japan (cf. Abst. 421). Race I is most prevalent, followed by races IV and II; all samples from Hokkaido were of race IX. Inoculation experiments involving all these races and 170 Japanese and introduced barley varieties are reported. The barley varieties

could be classified into 21 groups on the basis of their mode of reaction to the eleven Japanese mildew races.

1312 Sasakawa, M.
(Ecological studies on *Phytomyza nigra*. II. Varietal differences in cereals with respect to injury by *Ph. nigra*).
Saikyo Daigaku Gakujutsu Hokoku, Nogaku/Sci. Rep. Saikyo Univ., Agric. 1954 : No. 6 : 131–38. [Japanese].
The relative susceptibility of 10 naked barleys, 4 hulled barleys and 2 wheats was investigated. Number of eggs deposited was correlated with luxuriance and early maturation. Larval mortality was inversely correlated with the crude-protein content of the leaves.

MILLETS AND SORGHUMS

1313 Miyaji, Y. & Samura, T.
(The influence of atmospheric humidity at flowering time on flowering and pollination in *Setaria italica*).
Kagoshima Daigaku Nogakubu Gakujutsu Hokoku/Bull. Fac. Agric. Kagoshima Univ. 1954 : No. 3 : 1–6. [Japanese].
For optimum parting of the glumes and extrusion of the anthers, a moist atmosphere is required.

1314 Vřeský, F.
Stručná charakteristika některých odrůd čumizy a jejich použitelnost pro zemědělskou praxi v ČSR. **(A brief description of some millet varieties and their uses in Czechoslovakian agriculture).**
Sborn. čsl. Acad. zeměd. 1955 : **28** : 597–606.
Two varieties of *Setaria italica* introduced from the USSR and a variety each from Bulgaria and China were outstanding in earliness and forage yield among the material tested at Pohořelice.

1315 **Sorghums may be next important hybrid farm crop.**
Seed World 1955 : **77** : No. 6 : 40–41.
Hybrid grain sorghums have outyielded open-pollinated varieties in extensive tests in the USA by 20–40%; it is expected that they will gradually replace the older varieties during the next few years. Production of the hybrids as a commercial proposition has been made possible by using male-sterile lines.

1316 Garber, E. D.
The orientation of interchange complexes and quadrivalents at metaphase I in *Sorghum purpureo-sericeum*.
Genetics 1955 : **40** : p. 573. (Abst.)
The orientation of ring interchange-complexes in *S. purpureo-sericeum* ($2n = 10$) and of both ring and chain quadrivalents in an induced tetraploid of this species was apparently random since open and zigzag configurations occurred with approximately equal frequencies at metaphase I.

RICE

1317 **World catalogue of genetic stocks. Rice.**
FAO UN, Rome 1955 : Suppl. No. 5 : Pp. 13. (Mimeographed).
This issue contains information on genetic stocks submitted by breeders in the Gold Coast, India, Malaya, Philippines and Taiwan (cf. *PBA*, Vol. XXV, Abst. 1096).

1318 Angladette, A.
La riziculture Espagnole. **(The cultivation of rice in Spain).**
Riz et Rizic. 1955 : **1** : 58–68.
Data on the yield, period to maturity and resistance to diseases and borers of the principal rice varieties grown in Spain are included, together with brief notes on the rice breeding programme in that country. Colusa x Nano [Dwarf], Balilla and Precoz verde [Early Green] are the varieties most widely grown. Two new varieties, Stirpe 136 [Strain 136] and Beltran, are at present being distributed to growers (cf. *PBA*, Vol. XVIII, Abst. 953). Breeding aims include the improvement of the quality of the grain and the development of varieties adapted to saline soils.

1319 Chavan, V. M., Argikar, G. P. & Chaudhary, R. B.
Scientific research work on rice in South Gujarat.
Poona agric. Coll. Mag. 1955 : **46** : 6–10.
As a result of work carried out at the Bulsar Station, Surat, which has recently moved to Kosbad, Thana, improved strains of Kada, Wankvel and Kolam have been obtained. Kada strains are being crossed with other varieties in an attempt to combine the earliness and productivity of the former with the grain quality and blast resistance of the latter.

1320 **Improved paddy varieties for Gujarat.**
Indian Fmg. 1955 : **5** : No. 8 : 28–29.
Information is given on rice selections developed

at the Bulsar and Nawagam Stations, Bombay State. Hybridization has been initiated to obtain varieties with blast resistance and other improvements.

1321 Koshairy, M. A., Pan, C. L. & Gad el Hak
Rice breeding program in Egypt.
News Lett. FAO Internat. Rice Comm. 1955 : No. 13 : 1–6.

As a result of tests conducted at nine stations, the widely adapted, shattering-resistant *japonica* variety Yabani Mont. 47 is recommended for general cultivation. Of six varieties, Agami Mont. 1 was the most tolerant of saline conditions. Yabani Mont. 3 and Yabani Mont. 47 have been crossed with Java 3 in an attempt to produce long-grained lines with normal yield and maturity. Breeding for drought resistance is also in progress.

1322 Degras, M.
Étude de variétés en vue de leur amélioration pour la riziculture fluviale Ouest-Africaine. (**Study of rice varieties with a view to their improvement for riverain rice cultivation in West Africa**).
Riz et Rizic. 1955 : **1** : 135–40.

Preliminary breeding work at the Kankan Rice Experiment Station, French Guinea, is reviewed with reference to the application of technical measures to the special circumstances of rice cultivation in West Africa. In studies of the developmental physiology of the young rice plant and the effects of external environment, principally water level, on growth it was found that the relationship between the length of the coleoptile and the length of the mesocotyl of the young plant provided a valuable criterion for assessing the suitability of different varieties for cultivation in various environments. The varieties studied were divided into four main groups. The first group comprised forms of *O. glaberrima* var. *fluitans* from the central Nigerian delta. These floating rices are cultivated in deep water and have a coleoptile/mesocotyl ratio of 0·2–0·6. Forms of *O. sativa* var. *japonica* f. *fluitans* introduced from Indochina around 1920 were placed in the second category. These forms are grown in 1·5–2·5 m. of water and have a coleoptile/mesocotyl ratio of 0·6–0·8. In the third group are irrigated forms of *O. sativa* and *O. glaberrima*. They have a coleoptile/mesocotyl ratio of 0·5–1 and are cultivated in shallow water 0·3–1 m. deep. Upland forms of *O. glaberrima* comprise the fourth group. They are grown under nonirrigated conditions and have a coleoptile/mesocotyl ratio of above 1. It is concluded from these studies that the coleoptile/mesocotyl ratio gives a good indication of the suitability of a variety for a given environment. As it is a fairly stable varietal characteristic it should prove of value in the selection programme. In addition, varietal differences in reaction to sudden changes of water level were noted. The Kankan Rice Experiment Station, in addition to carrying out an extensive programme of selection and intervarietal hybridization, plans to introduce rice varieties from Cambodia.

1323 Geortay, G.
Variétés de riz diffusées par l'INÉAC. (**Rice varieties distributed by INÉAC**).
Bull. INÉAC 1955 : **4** : 309–18.

An historical account of rice breeding in the Belgian Congo since 1935 is given. The only varieties previously cultivated in the area were local strains producing low yields of grain of poor quality. The first variety to be distributed by the National Institute of Agronomic Research in the Belgian Congo (INÉAC) in its rice improvement programme was Y3, which was widely grown until 1945 when it was replaced by Rz111. Derived from a series of cumulative crosses between Manzano and several varieties of Indian origin, Rz111 gives a yield of 1750 kg. per ha., has a 1000-grain weight of 32·2 g. and is completely free of red grains, the presence of which had considerably reduced the commercial value of varieties previously grown in the Belgian Congo. In 1951 a new variety, designated MLE, was released by the Yangambi Experiment Station. It consists of four élite lines derived from a series of unspecified crosses and gives yields of 2320–2530 kg. per ha. The 1000-grain weight is 30·4–32 g. and the quality of the grain is superior to that of Rz111. R66 and R67, the two most recent varieties developed at Yangambi, are not as yet being grown on a wide scale. They give yields of 2500 and 2930 kg. per ha. respectively and produce grain of very good quality. Their 1000-grain weights are 31·9 and 31·8 g. respectively.

1324 Larter, L. N. H.
The background to rice variety improvement in Malaya.
News Lett. FAO Internat. Rice Comm. 1955 : No. 15 : 1–6.

Breeding in Malaya is outlined. Current work is concerned chiefly with selection within local

varieties but hybridization techniques are expected to become increasingly important.

1325 Brown, F. B.
Rice hybridization in Malaya.
News Lett. FAO Internat. Rice Comm. 1955 : No. 15 : 6–11.

Details are given of emasculation techniques and of a method of storing hybrid seed. The F_1 of crosses made in 1950 between local varieties showed an increase in tiller production and in yield over the parental means and some hybrids were resistant to the physiological disease known as red blight; segregation for resistance to lodging, for maturation period and for grain quality occurred in some progenies. Hybrids between local varieties were less variable in most characters and were more tolerant of unfavourable water conditions at the seedling stage than *indica* x *japonica* hybrids; the latter showed a higher degree of sterility than the former but exhibited normal meiosis. Hybrids in which the *japonica* parent was Taichu 65 or Pebifun, varieties which are already established in Malaya, were more vigorous and higher-yielding than those with other *japonica* parents. Most *indica* x *japonica* hybrids grew and yielded well at Telok Chengai, Kedah, and poorly at Pulan Gadong, Malacca.

1326 Shama Rao, H. K. & Seetharaman, R.
An interspecific hybrid in *Oryza*.
Curr. Sci. 1955 : **24** : 346–47.

A triploid hybrid ($2n = 36$), produced at the Central Rice Research Institute, Cuttack, by crossing *O. glaberrima* ($2n = 24$) with the pollen parent *O. eichingeri* ($2n = 48$), was intermediate between the parents in flowering time, plant height and spikelet size and resembled the male parent in its spreading habit, lax panicles and hairy, shattering spikelets; awns and ligules were longer than in either parent.

1327 Chang, W.-T.
(Reciprocal translocations in rice induced by X rays).
Ikushugaku Zasshi/Jap. J. Breeding 1955 : **5** : 27–31. [Japanese].

Two varieties, one from Taiwan, the other Japanese, were subjected to X irradiation, and a number of strains were obtained that were to some degree semisterile. Most of the semi-sterile plants showed a single, usually ring-shaped, quadrivalent at metaphase. Some of the fertile segregates produced fertile offspring when back crossed to the parental variety; other fertile segregates, presumably translocation homozygotes, gave semisterile offspring.

1328 Shibuya, T.
A trial of research for genes of paddy rice bearing upon its productivity and resistance against low temperature with special reference to types of diurnal variation of rooting activity in seedling.
Yamagata Kenritsu Norin Semmon Gakko Kenkyu Hokoku/Bull. Yamagata Agric. Coll. 1954 : **2** : 14–22.

Observations on the rate of root growth of a series of Japanese varieties at different times during the day are reported. The rate showed considerable fluctuation and the curve connecting growth rate with time varied according to the variety. An hypothesis associating the observed fluctuations with the activity of plasmagenes believed to control photosynthesis and respiration is presented. The genetic nature of resistance to low temperature is also discussed.

1329 Morinaga, T., Kuriyama, H. & Kudo, M.
(On the photoperiodic response of rice).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1955 : **23** : 258–60 [Japanese].

Twenty varieties emanating from Burma, Ceylon, India, Indochina, Indonesia, Japan, the Malay peninsula and Pakistan were grown under 10·5, 11·5, 12·5 hr. and natural day lengths in Japan in a project sponsored by the International Rice Commission. Under optimum photoperiods, the Japanese and Burmese varieties headed first (40–70 days). The optimum photoperiod was generally shorter for varieties from southern latitudes, few of which would head at all under the natural photoperiods of Japan.

1330 Adair, C. R.
Breeding rice for improved milling and cooking qualities.
News Lett. FAO Internat. Rice Comm. 1955 : No. 13 : 14–16.

Methods of testing for cooking and milling quality at the Rice-Pasture Experiment Station, Beaumont, Tex., are described.

1331 Guernier, M.
La culture du riz en sec en Casamance (sud-Sénégal). [**Upland rice cultivation at Casamance (southern Senegal)**].
Riz et Rizic. 1955 : **1** : 131–33.

The results are given of trials of introduced

varieties to determine their suitability for mechanical planting and harvesting in southern Senegal. At the Casamance experimental fields E425, R52 and R65 gave the highest yields. The yields of 902INONI and 415SMA have been considerably improved by selection.

1332 KAMATA, E.
(The relation between the iron, manganese, zinc and copper content of rice and resistance to *Piricularia oryzae*).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1955 : **23** : 281–82. [Japanese].

Evidence that a high content of the above elements is one of the factors contributing to the resistance of a variety to *P. oryzae* is outlined.

1333 KRASNOOK, N. P.
(Rice varieties for the province of Rostov and methods of organizing seed production).
Zemledelie (Agriculture) 1955 : No. 8 : 82–84. [Russian].

Dubovskiĭ 129, a hybrid between a Japanese variety derived from Krasnodar 3352 and a strain of Bivako-Mokki from India, is given the first place among the varieties cultivated in the province. It is outstandingly productive, has large white grain of high quality, shows resistance to *Piricularia* and other fungi, does not lodge in a properly irrigated field and is tolerant of salinity. It has a growth period of 90–105 days. Zeravšanika 2586, from the Ukrainian Rice Research Station, is as high-yielding as Dubovskiĭ 129 but is inferior in grain quality and resistance to lodging and *Piricularia*, reaching maturity 2–5 days later. Kendzo, though less productive than the above varieties, is distinguished by greater earliness and moderate external requirements. Mention is also made of a number of varieties that require only periodical submersion. Their yields and grain quality however are well below those of the varieties submersed during the whole growth period.

FORAGE GRASSES

1334 HEIN, M. A.
Registration of varieties and strains of other grasses, II.
Agron. J. 1955 : **47** : 547–48.

Stipa viridula 'Green' (cf. *PBA*, Vol. XVI, Abst. 1774) and *Arrhenatherum elatius* 'Tualatin' have been registered in the USA. The latter variety, selected at the Oregon Agricultural Experiment Station, is leafier, finer-stemmed and later in heading than unselected material and is resistant to head smut and shattering.

1335 L'amélioration des productions fourragères. Résultats obtenus en Algérie.
(The improvement of forage plant production. Results obtained in Algeria).
Bull. Soc. Agric. Algér. 1955 : No. 589 : 1–19.

Breeding work on winter cereals, maize, vetch, lucerne, sorghum, lupin, fodder peas and soya beans at the Central Research Station, Maison-Carrée, and at other centres in Algeria is reviewed briefly and the results of trials of indigenous and introduced varieties of these crops are given. *Agropyron elongatum*, *Festuca arundinacea*, *Dactylis glomerata* and rhizomatous forms of *Medicago sativa* have shown promise as forage crops suitable for growing on land ill-adapted to cereal cultivation. Selection from Algerian ecotypes of the last three species has proved highly successful, resulting in strains with increased yields and improved resistance to grazing, frost and drought.

DAVIES, J. G.
Plant and Soils Laboratory, Brisbane 1955 : Pp. 12.

The following section is concerned with plant breeding:—

1336 *Hutton, E. M. Plant breeding and genetics.* (*p. 9*).

The following pasture species are receiving attention in Queensland:—

Grasses. An attempt is being made to induce variation in the apomictic species *Paspalum dilatatum* by chemical and physical agents. *Setaria sphacelata* is being selected to obtain material for polycross tests. Colchicine-induced allopolyploids of *Phalaris tuberosa* x *Ph. minor* show promise.

Legumes. An attempt is being made to develop types of *Indigofera endecaphylla* and *Leucaena glauca* free from β-nitropropionic acid and mimosine respectively. In breeding *Phaseolus lathyroides*, frost tolerance, perennial habit and resistance to nematode, virus and bean fly are being sought. Interspecific hybridization of *Desmodium* is being attempted, particularly with the aim of securing types resistant to little-leaf virus. Rhizomatous forms of lucerne with resistance to soil saturation and leaf and stem diseases are being developed.

1337 CUGNAC, A. DE
Nouvelles expériences de croisements intergénériques entre des Graminées systématiquement éloignées. (New experiments on intergeneric crosses between systematically distant Gramineae).
CR Acad. Sci., Paris 1955 : **241** : 1495–97.
When plants of the species *Elymus* and *Agropyron* were pollinated with pollen of *Festuca* sp., *Lolium* sp., *Dactylis* sp. or *Phleum* sp., some 30–50% of the egg cells began to develop but aborted after a few days. No evidence was obtained as to whether the initial growth of the egg cells was due to fertilization or to parthenocarpic development stimulated by the foreign pollen. Fertilization of *Festuca* sp., *Lolium* sp., *Dactylis* sp. or *Phleum* sp. with pollen of *Elymus* sp. or *Agropyron* sp. produced no effect.

1338 TATEOKA, T.
(The chromosomes of Japanese grasses).
Senshokutai (Chromosome)/Kromosomo 1955 : No. 22–24 : 843–79. [Japanese].
A comprehensive review of published data on the chromosome numbers and caryotypes of Japanese grasses is presented, each tribe being treated in turn. The light thrown by these data on the evolutionary history of the family is also discussed.

1339 PIENAAR, R. DE V.
Combinations and variations of techniques for improved chromosome studies in the Gramineae.
J. S. Afr. Bot. 1955 : **21** : 1–8.
An improved squash technique for studying root-tip chromosomes of grasses is described. The schedule involves pretreatment of the root tips with monobromonaphthalene or colchicine, fixation in La Cour's 2BD fixative, maceration in a pectinase solution and staining with La Cour's Leuco-basic-fuchsin. For pollen mother cells, fixation with a mixture of methyl alcohol, chloroform and propionic acid, in the proportions 6 : 3 : 2, with a trace of ferric chloride added, proved satisfactory.

1340 MÜNTZING, A. & NYGREN, A.
A new diploid variety of *Poa alpina* with two accessory chromosomes at meiosis.
Hereditas, Lund 1955 : **41** : 405–22.
A diploid of *P. alpina* var. *xerophila* ($2n = 14$) from Ardez, Switzerland, had two supernumerary (B) chromosomes which underwent somatic elimination, as in a strain from Innsbruck, Austria, with 2–8 supernumeraries (cf. Abst. 22). The two B chromosomes formed an extra bivalent in 85% of the PMC, indistinguishable from the seven normal bivalents. Some plants had smaller extra ("B") chromosomes than those usually observed; these paired less well, were present in the root tips and appeared to have a terminal centromere. "B" chromosomes were occasionally observed in root-tip cells of plants with B chromosomes at meiosis. The smaller type may have been the product of misdivision, the genetic entity responsible for somatic elimination being located on the chromosome segment which had been lost. Cases of chimerical constitution at meiosis and in the roots with respect to the number of extra chromosomes were detected. Two other $2n$ forms, *P. badensis* and a strain from eastern France provisionally designated *P. molineri* (= *concinna*), did not contain any accessories.

1341 GRUN, P.
Cytogenetic studies in *Poa*. III. Variation within *Poa nervosa*, an obligate apomict.
Amer. J. Bot. 1955 : **42** : 778–84.
Plants from the Sierra Nevada, Calif., were found to be diplosporous and nonpseudogamous (cf. *PBA*, Vol. XXV, Abst. 2051). Plants from geographically isolated localities were distinct both cytologically and morphologically, variation being evident even in limited areas. The majority of specimens from the interior of Washington State had chromosome numbers ranging from $2n = 81$ to 90 whereas most of those from the Sierra Nevada had $2n = 63$. Interspecific hybridization may be partly responsible for introducing variability into *P. nervosa*, as suggested by a study of two small populations, one in California and the other in Washington.

1342 **Troy bluegrass performs well in Montana: seed supplies being increased.**
What's New Crops Soils 1955 : **8** : No. 1 : p. 26.
Troy, a variety of *Poa pratensis* introduced from Turkey, has outyielded other strains at Bozeman, Mont., but had a lower protein content. Spring growth begins about two weeks earlier than in other varieties and recovery after harvest is rapid.

1343 HEIN, M. A.
Registration of varieties and strains of orchardgrass (*Dactylis glomerata*).
Agron. J. 1955 : **47** : p. 539.
Potomac, approved for registration in the USA in 1955, is described (cf. *PBA*, Vol. XXV, Abst. 3098).

1344 Brix, K.
Quantitative Untersuchungen an chlorophylldefekten und normalen diploiden und tetraploiden Pflanzen. (Quantitative investigations of chlorophyll deficient and normal diploid and tetraploid plants).
Züchter 1955 : **25** : 246–52.

Attempts were made to classify chlorophyll-deficient segregates obtained from the natural tetraploid *Dactylis glomerata* var. *chlorina* and from experimental lines of tetraploid and diploid tomatoes according to the amount of chlorophyll present in the leaves. External environmental conditions, in particular light and temperature, were found, however, to exercise such a considerable influence on the degree of chlorophyll deficiency that an accurate classification according to genotype was impossible. It is therefore concluded that chlorophyll deficiency in plants does not provide a satisfactory medium for carrying out experimental studies on quantitative inheritance.

1345 Stebbins, G. L. & McCollum, G. D.
The induction of genic and chromosomal sterility in a subspecies hybrid of *Dactylis* by irradiation of pollen.
Genetics 1955 : **40** : p. 598. (Abst.)

"A plant of the diploid form *Dactylis glomerata* subsp. *lusitanica*, was pollinated with pollen from another diploid, subsp. *judaica*, the pollen having been irradiated with 1250 r. Out of 126 F_1 plants which were raised, 51 had less than 20 per cent of normal pollen. Seed fertility of these plants ranged from 0 to 60 per cent. Among 43 individuals of an F_1 progeny of subsp. *lusitanica* x *judaica* made with non-irradiated pollen, the range was from 38 to 88 per cent of normal pollen. Among 120 plants of a progeny obtained by pollinating the same plant of subsp. *lusitanica* with pollen of another plant of subsp. *lusitanica* which had been irradiated with 1250 r., only 5 plants were found with less than 20 per cent of normal pollen. At meiosis the majority of the *lusitanica* x *judaica* plants with low pollen fertility form seven bivalents in at least some sporocytes, but some were found which form one ring or chain of four chromosomes, and a few had two rings or chains of four. Four of the sterile plants were treated with colchicine to double their chromosome number. Two of the induced tetraploids were fertile. One of these was derived from a diploid with slightly irregular meiosis but little obvious structural hybridity, while the other was derived from a diploid heterozygous for two translocations. The other two induced tetraploids remained as sterile as the diploid sectors of the same plant. In one of these sterility was clearly due to marked disturbances of meiosis initiated at I anaphase."

1346 Hein, M. A.
Registration of varieties and strains of bromegrass (*Bromus* Spp), II.
Agron. J. 1955 : **47** : 533–34.

The following four varieties of *B. inermis*, registered in the USA in 1955, are described: Homesteader (cf. *PBA*, Vol. XXII, Abst. 1978), Lancaster (cf. *PBA*, Vol. XXII, Abst. 1973), Lyon (cf. *PBA*, Vol. XXI, Absts. 1099 and 1100) and Lincoln, which was developed at the Nebraska Agricultural Station and is characterized by the ease of establishing seedlings, good forage and seed yields and relative freedom from disease.

1347 Walters, M. S.
A study of half-chromatid fragments in meiosis of the hybrid *Bromus trinii* x *B. maritimus*.
Univ. Calif. Publ. Bot. 1955 : **28** : 1–13.

Further hybrids of *B. trinii* x *B. maritimus*, like the material previously investigated, have shown spontaneous chromosome breakage and reunion (cf. *PBA*, Vol. XX, Abst. 1694). They have however exhibited an additional type of fragment, believed to be the result of breakage of an effectively quadripartite chromosome at early prophase, and detectable as a single fragment attached to the end of a centre chromatid, as paired fragments of equal size attached to a single centric chromatid, or as two single fragments of unequal size attached to the end of one chromatid arm. Most of the fragments observed at anaphase I are interpreted as being of the chromatid type.

1348 Jenkin, T. J.
Interspecific and intergeneric hybrids in herbage grasses. XVI. *Lolium perenne* and *Festuca pratensis* with references to *Festuca loliacea*.
J. Genet. 1955 : **53** : 379–441.

A few $2n$ F_1 hybrids were obtained from *L. perenne* ♀ x *F. pratensis* ♂ and the reciprocal and from *F. pratensis* x (*L. perenne* x ? *L. italicum*) (cf. *PBA*, Vol. XXV, Absts. 2064–70). The F_1 seedlings were extremely weak, with the exception of one *F. pratensis* ♀ x *L. perenne* ♂ hybrid produced by using a mixture of pollen from both parents. To explain the origin of this plant, which was normal in vigour even at germination, it is suggested that a pollen tube of *L. perenne* and one of *F. pratensis* reached the embryo sac simultaneously, a hybrid embryo

and a pure *F. pratensis* endosperm being formed. The hybrids bore indehiscent anthers and had a low degree of female fertility. Some plants were readily classifiable as *F. loliacea*; others would have presented difficulties in an attempt to classify them. The general similarity between naturally occurring 2*n* *F. loliacea* and some of the artificially produced F_1 hybrids supports the view that the former is the result of crossing between *L. perenne* and *F. pratensis*. Only one established back-cross plant was secured by pollinating the F_1 hybrids by *F. pratensis*; pollination with *F. arundinacea* was slightly more successful; plants from these crosses were highly sterile. Back crossing to *L. perenne* gave second-generation derivatives of three types: (1) effectively *L. perenne* plants possessing a high degree of fertility, (2) plants fairly similar to *L. perenne* but with low fertility, probably as the result of chromosomal interchange at meiosis in the F_1 hybrids, and (3) one triploid (56–bE–2). Further breeding with diploids provided evidence of the presence of *F. pratensis* genes in effectively *L. perenne* plants. When crossed with *L. perenne*, 56–bE–2 gave rise to progeny showing a wide range of variation and possibly including an approximate *L. perenne* tetraploid; the progeny of the near-triploid 23–bE–7/1 [(*L. perenne* x *F. arundinacea*) x *L. perenne*] x 56–bE–2 also contained a possible tetraploid of this type. The cross between 56–bE–2 and wild 3*n* *F. loliacea* failed. Data obtained by Peto and other investigators suggest that at gametogenesis in the F_1 hybrid progenitors of 56–bE–2 and 23bE–7/1 chromosomal interchange had occurred but that no such interchange had affected 3*n* *F. loliacea*. It is therefore postulated that the natural triploids are first-generation hybrids produced by crossing between (1) *L. perenne* and a tetraploid type of *Festuca* not yet identified in Britain or (2) *L. perenne* and *F. pratensis* by the type of double fertilization already referred to. The possible effect of crossing between *L. perenne* and *F. pratensis* and of the subsequent production of back-cross and other derivatives of such hybrids upon a natural population is discussed.

1349 Jenkin, T. J.
Interspecific and intergeneric hybrids in herbage grasses. XVII. Further crosses involving *Lolium perenne*.
J. Genet. 1955 : **53** : 442–66.

Attempts to cross *L. perenne* with *Arrhenatherum avenaceum*, *Brachypodium sylvaticum*, *Bromus erectus*, *Bromus asper*, *Dactylis glomerata* and *Lepturus cylindricus* were unsuccessful. The single plant obtained from *L. perenne* ♀ x *Glyceria fluitans* ♂ produced no inflorescences. *L. perenne* ♀ x *Festuca gigantea* ♂ gave established F_1 plants but seeds from the reciprocal failed to germinate; the anthers of these hybrids were indehiscent and pollination with either parent did not result in caryopses. Plants with indehiscent anthers were obtained from *L. perenne* ♀ x *F. arundinacea* ♂; the back crosses were highly sterile but plant 23–bE–7/1 (cf. Abst. 1348) gave progenies when pollinated by *L. perenne*; the single plant obtained from pollination of 23–bE–7/1 by *F. arundinacea* produced no descendants. Second back-cross individuals varied considerably in type and vigour, although in no case was the influence of *F. arundinacea* ancestry strongly evident; some individuals were morphologically indistinguishable from *L. perenne*. With continued back crossing, a progressive return to the morphology and chromosome number of *L. perenne* and to full fertility was obtained. Second back crosses with 2*n* = 14–18 were successfully crossed with *F. arundinacea* and with *L. perenne*. Hybridization between *L. perenne* and *F. arundinacea*, it is concluded, would be unlikely to have a lasting effect upon a natural population.

1350 Jenkin, T. J.
Interspecific and intergeneric hybrids in herbage grasses. XVIII. Various crosses including *Lolium rigidum* sens. ampl. with *L. temulentum* and *L. loliaceum* with *Festuca pratensis* and with *F. arundinacea*.
J. Genet. 1955 : **53** : 467–86.

The following crosses, attempted on a very limited scale, gave negative results: *Bromus asper* ♀ x *Brachypodium sylvaticum* ♂ and the reciprocal, *Avena pratensis* ♀ x *Bromus erectus* ♂, *Bromus erectus* ♀ x *Festuca arundinacea* ♂ and *Lolium loliaceum* ♀ x *Lepturus cylindricus* ♂.

No plants were obtained from *Lolium temulentum* ♀ x *L. rigidum* sens. ampl. ♂ (cf. *PBA*, Vol. XXIV, Abst. 3040) but one (666–bE–1) was secured from the reciprocal. Back crosses of 666–bE–1 ♀ to either parent were successful, the cross to the parental line of *L. rigidum* sens. ampl. giving four plants which morphologically have a close resemblance to the recurrent parent. One plant was effectively a pure representative of *L. rigidum* sens. ampl. in breeding behaviour and had inherited the character of brittle stem introduced as a simple recessive into 666–bE–1 by the ♂ parent. Two of the plants closely approached their *L. rigidum* sens. ampl. parent in breeding reactions; the fourth provided evidence of hybridity. One established plant

was obtained from *L. italicum* ♀ x *F. pratensis* ♂ but it failed to reach full maturity; seeds from the reciprocal failed to germinate. Germinable seeds but no plants were obtained from *L. rigidum* sens. ampl. ♀ x *F. pratensis* ♂. Caryopses were produced in matings of *F. pratensis* and *L. temulentum* in either direction and in *F. pratensis* ♀ x *L. loliaceum* ♂ but no seeds succeeded in germinating. When *L. loliaceum* was pollinated by *F. pratensis,* seed setting, germination and F_1 plant establishment were high in comparison with crosses of other *Lolium* spp. as female parents with *F. pratensis*. *L. loliaceum* ♀ x *F. arundinacea* ♂ gave remarkably successful results, 42% of the florets effectively emasculated producing mature plants. In conclusion, the author discusses the significance of breeding behaviour in elucidating phylogenetic relationships within and between *Festuca* and *Lolium*.

1351 Connor, H. E. & Cook, A. B.
The breeding system of New Zealand fescue-tussock *Festuca novae-zelandiae* (Hack.) Cockayne.
NZ J. Sci. Tech. 1955 : **37** : 103–05.

The above species proved to be allogamous and highly self-sterile; the S_1 generation showed marked reduction in vigour.

1352 Lundqvist, A.
Genetics of self-incompatibility in *Festuca pratensis* Huds.
Hereditas, Lund 1955 : **41** : 518–20.

Data on the progenies of two highly self-incompatible plants, one representing Svalöf Late and the other the Canadian strain Mefon, suggest that, as in rye (cf. *PBA*, XXV, 984), incompatibility is determined by the combined action of two multiallelic systems of the oppositional type at loci designated *S* and *Z* respectively.

1353 Chopinet, R. & Dujardin, J.
Étude de quelques populations d'*Arrhenatherum elatius* en vue de leur utilisation agronomique. (**Study of some populations of *A. elatius* with a view to their agronomic utilization**).
Ann. Inst. nat. Rech. agron., Paris 1955 : Sér. B : **5** : 53–66.

The results of studies of 26 populations obtained from different parts of France are presented. Considerable diversity was observed between the various ecotypes in respect of growth habit, period to maturity, yield of hay, percentage of leaves per given weight of cut grass and ability to regrow quickly after mowing. The ecotypes giving the highest yields could be classified into two categories. Some, such as the Normandy ecotypes, matured late but gave exceptionally high yields at the first mowing. Others, such as the Crau ecotype, matured early and could be cut 3–4 times. The possibility of selection for higher yields and for adaptability to different environmental and cultural conditions is discussed and it is suggested that *A. elatius* may be of considerable value in mixed sowings with clover or other leguminous forage crops.

1354 Nirodi, N.
Studies on Asiatic relatives of maize.
Ann. Mo. bot. Gdn. 1955 : **42** : 103–30.

Morphological and cytological investigations were carried out on *Coix poilanei* ($2n = 10$), *C. lacryma-jobi* ($2n = 20$), *C. gigantea* ($2n = 40$), *Polytoca macrophylla* ($2n = 40$) and *Chionachne koenigii* ($2n = 20$); *C. lacryma-jobi* was represented by var. *typica* and two forms of the variety Mu-yen. Chromosome morphology was studied in the tapetal nuclei, which in all the species underwent a type of endomitosis bearing some resemblance to that in the tapetal cells of the tomato. At pachytene, *Coix* showed conspicuous knobs which were not present in the other two genera. It is suggested that *Coix* is more closely related to the Maydeae of the New World than to *Polytoca* and *Chionachne* (cf. *PBA*, Vol. XXV, Abst. 2036).

1355 Farquharson, L. I.
Apomixis and polyembryony in *Tripsacum dactyloides*.
Amer. J. Bot. 1955 : **42** : 737–43.

In races with $2n = 72$ facultative apomixis of the pseudogamous type frequently occurs. Polyembryony was found in 43 of the 49 collections made in the south eastern part of the USA, with a frequency exceeding 50% in some races. Examination of 124 plants, including twins and triplets, revealed $2n$ numbers of 36, 45, 54, 90 and 108, in addition to $2n = 72$ in 69 plants. The members of twin or triplet sets of seedlings often differed widely in chromosome number.

1356 Forbes, I. (Jun.)
A cytogenetic, morphological and taxonomic study of *Zoysia* species and hybrids.
Abstr. Diss. Univ. Md. 1955 : **8** : No. 2 : p. 24 : (Abst.).

On the basis of cytological observations and data on cross compatibility, *Z. japonica*, *Z. matrella* and *Z. tenuifolia*, all with $n = 20$, were classified as varieties of a simple species, *Z. matrella*. Their genomes were highly homologous. Evidence was obtained that the varieties intercross

under natural conditions. *Z. macrostachya* ($n = 20$) showed regular meiosis. Hybrids of this species with *Z. matrella* vars. *japonica* and *matrella* were produced. Genes for leaf width, floret number and floret shape in the intervarietal hybrids of *Z. matrella* lacked dominance but the effect of those conditioning floret size involved dominance. Var. *japonica* transmitted winter hardiness to its hybrids, valuable turf types combining fine leaves and winter hardiness being obtained from crosses of this variety with var. *tenuifolia*.

1357 Krishna Rao, P. & Mahudeswaran, K.
Improvement of the quality of fodder in Periamanjal Cholam (*Sorghum durra*) in Madras State.
Madras agric. J. 1955 : **42** : 229–32.

An improved selection, AS8112, has been obtained by crossing strain Co.1 of Periamanjal sorghum, which has pithy stalks, with Co.10, a juicy-stalked strain of Patcha Jonna. AS8112 is superior to Co.1 in both grain and straw yields and has sweet juicy stalks.

1358 Karper, R. E.
Registration of sorghum varieties, VIII.
Agron. J. 1955 : **47** : p. 540.

The Sudan grass Greenleaf (cf. *PBA*, Vol. XXIV, Abst. 2079) and the sweet sorghum Tracy (cf. *PBA*, Vol. XXIII, Abst. 2866), both of which have been approved for registration in the USA in 1955, are described.

1359 Hirayoshi, I., Nishikawa, K., Kato, R. & Kitagawa, M.
(Cytogenetical studies on forage plants. III. Chromosome numbers in *Miscanthus*).
Ikushugaku Zasshi/Jap. J. Breeding 1955 : **5** : 49–50. [Japanese].

Japanese samples of *M. sinensis* var. *condensatus* and *M. tinctorius* were all found to be diploid ($2n = 38$).

1360 Veyret, Y.
Étude caryologique du *Sorghum guineense* Stapf. **(Karyological study of *S. guineense* Stapf).**
Agron. trop., Nogent 1955 : **10** : 604–09.

The results of cytological studies of mitosis and meiosis in *S. guineense* ($2n = 20$) are reported. Both processes were regular. Two large chromosomes, 4·5 μ in length and with marked constrictions, were observed at mitosis. The remaining chromosomes measured 1·7–3·2 μ. Meiosis was characterized by a long and complicated prophase but was otherwise normal.

1361 Sičkarj, N. M.
(Production of noncyanogenic forms of sorghum).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1953 : **30** : No. 2 : 219–21. [Russian].

Employing a quick picric-acid test, examinations were made of 150 varieties of sorghum contained in the world collection at Leningrad. Three forms of sweet sorghum and three of grain sorghum were selected on account of their low production of hydrocyanic acid; in their progeny variations were observed and only those plants with the lowest contents were selected; from one of the sweet sorghums, Krasnoe Voskovidnoe 668 [Red Waxy 668] a constant form with only 0·006% hydrocyanic acid in the growing plant was selected and a grain sorghum from India, Durra Buraja 1866 [Brown Durra 1866], gave rise to a number of plants entirely free from hydrocyanic acid. Two other Indian forms, White Durra 1812 and Red Durra 1884, have also given rise to noncyanogenic plants.

1362 Hirayoshi, I. & Yasue, T.
(Cytogenetical studies on forage plants. II. Chromosome numbers and characteristics of *Digitaria* species native to Japan).
Ikushugaku Zasshi/Jap. J. Breeding 1955 : **5** : 47–48. [Japanese].

The species described are *D. praecox* ($2n = 18$), *D. ischaemum* ($2n = 36$) and *D. ciliaris* ($2n = 54$). Meiosis is regular in all cases.

1363 Snyder, L. A., Hernandez, A. R. & Warmke, H. E.
The mechanism of apomixis in *Pennisetum ciliare*.
Bot. Gaz. 1955 : **116** : 209–21.

Apomixis, involving apospory and pseudogamy, occurred in seven collections from Puerto Rico, India, Australia and several localities in Africa. Aneuploid chromosome numbers of $2n = 43$ and $2n = 48$ were found in two strains and the tetraploid number $2n = 36$ in the other five. Limited quadrivalent formation and considerable meiotic irregularity, particularly in aneuploid plants, were observed during microsporogenesis. In the ovules, the products of meiosis usually degenerated and unreduced 4-nucleate embryo sacs developed from one or more nucellar cells, the average number of embryo sacs per ovule differing among the strains; occasionally, 8-nucleate embryo sacs, apparently reduced, were formed. Pollination was necessary for the initiation of endosperm

development, which normally preceded division of the unreduced and unfertilized egg.
Closely similar reproductive behaviour was observed in a single collection of *Cenchrus setigerus*.

1364 Hayman, D. L.
Centromeric behaviour of the univalents in two *Phalaris* hybrids.
Aust. J. biol. Sci. 1955 : **8** : 241–52.

The centromeres of the univalents in *Ph. coerulescens* ($2n = 14$) x *Ph. minor* ($2n = 28$) did not divide at anaphase I but instead neocentromeres distally situated controlled the movement of the chromosomes, bridges being formed. Formation of the cell wall caused breakage of the bridges. At anaphase I neocentric activity occurred only infrequently. In *Ph. tuberosa* ($2n = 28$) x *Ph. minor* some univalents showed misdivision of the centromere during both meiotic divisions. Usually the centromeres divided normally after the neocentromeres had acted.

1365 Wöhrmann, K.
Keimungsphysiologische, Fertilitäts- und zytologische Untersuchungen an Nachkommenschaften röntgenbestrahlter Samen von *Alopecurus pratensis* L. (**Investigations on the physiology of germination, fertility and the cytology of progenies from X-irradiated seeds of *A. pratensis* L.**).
Z. Pflanzenz. 1955 : **34** : 391–408.

Experiments on dried seeds of *A. pratensis*, a cross-pollinated natural polyploid with $2n = 28$, were carried out at the Max Planck Institute for Breeding Research, Neuhof, Germany, to obtain information on the effects of X irradiation on germination, seedling vigour, meiosis and fertility. The critical dose was found to lie between 18 and 26 kr. Germinability, seedling vigour and fertility were all adversely affected by irradiation, the effect varying in linear proportion to the dose given. Cytological studies of the pollen mother-cells of plants grown from X-irradiated seed revealed frequent disturbances at meiosis. In several cases, the presence of one or two supernumerary chromosomes, probably B chromosomes, was noted. These supernumerary chromosomes were euchromatic, had median constrictions and frequently formed bivalents. A high rate of pollen sterility was found in plants from X-irradiated seed. Disturbances at anaphase and telophase and the formation of multivalents at diakinesis were observed. Among the material studied were several plants with albino and partly albino ears. The pollen-mother cells of these plants, all of which were highly sterile, exhibited chromosome stickiness and irregular cell division at meiosis.

1366 Tateoka, T.
(**The caryotype of *Briza minor*).**
Senshokutai (Chromosome)/Kromosomo 1955 : No. 22–24 : 786–87. [Japanese].

The morphology of the metaphase chromosomes in the root tips is described. The caryotype formula is $K = 10 = 2A^{m} + 2B^{sm} + 2_{sc}C^{sm} + 2D^{sm} + 2E^{sm}$.

1367 Hein, M. A.
Registration of varieties and strains of wheatgrass, II (*Agropyron* Spp.).
Agron. J. 1955 : **47** : p. 546.

A. desertorum 'Nordan', registered in the USA in 1955, is described (cf. *PBA*, Vol. XXIV, Abst. 3058).

1368 Boyle, W. S. & Holmgren, A. H.
A cytogenetic study of natural and controlled hybrids between *Agropyron trachycaulum* and *Hordeum jubatum*.
Genetics 1955 : **40** : 539–45.

Artificial and putative natural F_1 hybrids between *A. trachycaulum* and *H. jubatum*, both of which are fertile tetraploids having 14 bivalents at meiosis, were sterile and morphologically similar, being taller than but otherwise intermediate between the parents in most characters. Many univalents were observed at meiosis. Eighty-nine per cent of the meiotic cells contained at least 10 chromosomes associated in pairs or occasionally forming multivalents, the average number of bivalents being 6·3 per cell. These observations are regarded as indicating that *Hordeum* and *Agropyron* have one genome in common. The hybrids appeared to be identical with material hitherto allocated to the species *Elymus macounii*.

1369 Hunziker, J. H.
Estudio citogenético de un híbrido entre *Elymus patagonicus* y *Agropyron agroelymoides* (Gramineae). [**Cytogenetic study of a hybrid between *E. patagonicus* and *A. agroelymoides* (Gramineae)**].
Rev. Invest. agríc. B. Aires 1953 : **7** : 73–79.

Studies of *E. patagonicus* showed that in over 91% of the cells meiosis was normal, some 5·8% of cells having laggards, bridges and other irregularities; fertility varied in different plants, seed sets of from 42% to 84% being observed. A certain number of univalents were noted in *A. agroelymoides*, where pollen fertility was 88%

and seed set 73·5%. The hybrids between the two species were completely sterile, some of them being dwarfs; others were heterotic and morphologically intermediate between the parental species. One of them was examined cytologically; it formed open bivalents varying in number from 5 to 14, with an average of 9·1; trivalents, quadrivalents and occasionally higher associations were observed and lagging and bridge formation were frequent. All pollen grains were sterile.

It is concluded that much of the pairing observed resulted from autosyndesis in the chromosomes of *A. agroelymoides*; the other irregularities suggest that this species is a structural heterozygote with a number of duplications; it is not very closely related to *E. patagonicus* and is thought to be an allohexaploid.

1370 Hunziker, J. H.
Estudios citológicos en las Hordeas (Gramineas) I. [**Cytological studies in the Hordeeae (Gramineae) I.**].
Rev. Invest. agríc. B. Aires 1954 : **8** : 99–104.

Details of the chromosome number and constitution in a number of species of *Agropyron* and *Elymus* are presented. In both genera the annual species examined had smaller chromosomes than the perennial.

1371 Knowles, R. P.
A study of variability in crested wheatgrass.
Canad. J. Bot. 1955 : **33** : 534–46.

Thirty-one strains of crested wheatgrass from European and North American sources were classified into six morphological forms, representing *Agropyron cristatum, A. imbricatum, A. michnoi, A. desertorum, A. sibiricum* and *A. fragile* respectively. Most strains of *A. cristatum* were diploid ($2n = 14$) but two were tetraploid. Strains of all other forms were tetraploid. The $4n$ strains showed marked irregularity in pairing at metaphase I, 10_{II} and $1–3_{IV}$ generally being formed; accessory chromosomes were frequent at meiosis but rare in root-tip cells. The only $4n$ species with which diploids of *A. cristatum* crossed readily was *A. michnoi*. The tetraploid species showed considerable interfertility; *A. michnoi* did not however cross as pollen parent with *A. imbricatum* and *A. desertorum*. The most desirable strains agronomically belonged to *A. cristatum, A. desertorum* and *A. imbricatum*. Data are given on chromosome associations in the various F_1 hybrids. The most vigorous hybrids were the sterile plants obtained from *A. desertorum* x *A. cristatum*.

LEGUMINOUS FORAGE PLANTS

1372 Heikinheimo, A.
Sinimailasen ja puna-apilan vertailua Tammiston kasvinjalostuslaitoksella v. 1947–54 suoritettujen viljelykokeiden perusteella. (**Comparison of lucerne and red clover based on cultivation trials at the Tammisto Plant Breeding Station, 1947-54**).
Siemenjulk. Hankkijan Kasvinjalos-Laitos Tammisto 1955 : 151–79.

Extensive trials of different strains of these two herbage crops are reported. Data are given for response of several lucerne strains to different planting techniques. Seed yields tend to be highest in du Puits and Øtofte 17 lucernes. The best yields of forage were from the strains Øtofte 17, Dænfeldt and du Puits but the results varied much in different trials.

1373 Multamäki, K.
Jokioisten sinimailanen. (**Jokioinen lucerne**).
Maatalous ja Koetoiminta 1954 : **9** : 119–37.

The first Finnish lucerne variety, Jokioinen, is the result of some 30 years breeding work with this crop. The data given show its superiority over foreign lucerne varieties. It is recommended for southern Finland.

1374 Buller, R. E., Pitner, J. B. & Ramirez, M.
Behavior of alfalfa varieties in the Valley of Mexico.
Agron. J. 1955 : **47** : 510–12.

Details are given of the yields, plant height, resistance to disease, time of maturity, recovery after cutting and hardiness of 11 varieties tested during 1952–4 at an altitude of 7600 ft. above sea level in the Valley of Mexico.

1375 Spickschen, G.
Luzernesorten in den Vereinigten Staaten. (**Lucerne varieties in the United States**).
Saatgutwirtschaft 1955 : **7** : 283–84.

The principal varieties grown in the USA are described briefly and a survey is given of current breeding work at the Iowa Agricultural Experiment Station.

1376 Fyfe, J. L. & Wills, A. B.
Disturbed segregations of an albino in lucerne.
Heredity 1955 : **9** : p. 291. (Abst.).

The tetrosomic segregation ratios in an albino of *Medicago sativa* ($2n = 4x = 32$) were disturbed by two contrary influences: (1) seeds with albino

embryos often failed to mature, with a consequent deficiency of albinos; (2) a duplex plant selfed gave a significant excess of simplex plants, a fact which, together with other evidence, suggests that the albino allele interferes with self incompatibility.

1377 Twamley, B. E.
Flower colour inheritance in diploid and tetraploid alfalfa.
Canad. J. agric. Sci. 1955 : **35** : 461–76.
A full account is presented of work previously summarized in *PBA*, Vol. XXV, Abst. 2848.

1378 Čumakov, V.
Biológia kvitnutia lucerny a doopelovanie. (**The biology of flowering of lucerne and supplementary pollination**).
Pôdohospodárstvo 1954 : **1** : No. 1 : 20–36.
A higher yield of improved seed can be achieved by means of supplementary pollination. Natural pollinators of lucerne, the role of domesticated and wild bees and the possibilities of artificial tripping are discussed.

1379 Lubenec, P. A.
(**Specific composition and assessment of breeding value of cultivated and wild lucernes**).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1953 : **30** : No. 2 : 3–155. [Russian].
Figures are given showing the high yields obtained in different parts of the Soviet Union from lucerne, alone and in mixtures with various other forage species, and the beneficial effect it exercised on the soil and on succeeding crops. Classifications of the genus *Medicago* proposed by previous authors are examined and many of the species are found to have been established with insufficient justification, often on the basis of herbarium specimens only. Examination of wild populations has shown that the characters of many of the so-called species merge. *M. varia* is clearly a hybrid between *M. falcata* and *M. sativa* and many of the other species will also probably prove to be hybrids. All forms of wild perennial lucernes could be accommodated in the species *M. sativa*, *M. falcata*, *M. glutinosa*, *M. tianshanica*, *M. trautvetteri*, *M. marina*, *M. rupestris* and *M. coerulea*. Existing classifications of the cultivated forms of *M. sativa* are also found to be unsatisfactory and no grounds are discovered for separating it into several species. On the basis of a study of 2376 specimens collected in different localities throughout the world the cultivated lucernes are here divided into seven botanical varieties and 34 ecogeographical groups. Keys for the identification of the varieties and groups are given and their characteristics are described and illustrated.
Differences in frost resistance were found to be dependent on variety and on time of sowing, age of the plot, manuring and other cultural conditions. The wild forms of *M. falcata* from northern regions proved the most resistant, some of them, and selections from them, having survived temperatures down to −39° C. *M. sativa* forms are less resistant, those from western Siberia, Transcaucasia and Canada being among the hardiest. Tolerance of spring frosts was correlated with high sugar content of the stems. Forms from Siberia, western China, Transcaucasia, Scandinavia and Canada were not damaged by spring frosts.
Observations on the influence of a number of factors on flowering and fruit ripening showed the forms from Yemen to have the shortest and those from Central Asia, Iran, Afghanistan and western China the longest period of vegetation. The early varieties were almost indifferent to length of day; medium and late varieties reacted to short day by delaying flowering and reducing their seed yield. Plant height was greatest in the local varieties of Asia Minor and Transcaucasia. Leafiness was found to be correlated with the protein content of the resulting hay and both were highest in forms from the Transcaucasian foot hills and the Hiva oasis. Resistance to *Pseudopeziza medicaginis* and *Uromyces striatus* was greatest in specimens from the Central Asian republics, Iran, Afghanistan and western China. Data are cited showing that lucerne is very sensitive to reduction of soil humidity; specimens displaying the greatest tolerance of drought were those from Yemen, Transcaucasia and Tibet. The best hay yields were given by the local forms from the North Caucasus, closely followed by those from the Ukraine and the South-east of the Soviet Union; Slavjanskaja Mestnaja [Local Slavjanskaja] exceeded Zaĭkevič by 3·9% and Grimm by 5·2% when tested in the North Caucasus. Examination of the root systems showed that they attained the greatest development in the varieties giving the highest yields of hay, such as Slavjanskaja Mestnaja, Zaĭkevič, Poltava 256 and Old Franconian. The ancient local races also gave a better response to manurial dressing than less well-adapted varieties. Slavjanskaja Mestnaja was one of the best in protein content, in which respect Ukrainian forms such as

Zaĭkevič and Poltava Local also receive favourable mention.

Data are presented which show the advantage of summer planting for seed production of lucerne in the south east of the Soviet Union; the influence of factors such as moisture, light, spacing and bees on seed yield is also discussed. Varieties differed in their seed-yielding capacity; they differed also in the size and depth of the root system and its conformation, some having a more strongly pronounced main root, others a number of more nearly equal roots. The development of the root was found to be positively correlated with the yield of green matter, so that the most highly yielding varieties also had the most beneficial effect on the soil. Observations were made on wild lucernes collected in a number of expeditions by the Institute of Plant Industry. Specimens from the foot hills of Transcaucasia were later in flowering and seed ripening than the standard Slavjanskaja Mestnaja and were lower in drought resistance and yield of hay and seed, but they recovered more quickly after cutting and were resistant to spring frosts and most fungous diseases; they are regarded as useful sources of breeding material. Specimens from the foot hills of Central Asia were late in flowering and ripening and poor in recovery but proved resistant to drought and spring frost, and some of them also to fungous diseases. Wild forms of *M. coerulea* from the Caspian shores were late and slow in recovery but were relatively free from fungous diseases and very resistant to drought and spring frosts and tolerant of saline soils. Specimens of wild *M. hemicycla* were leafy and resistant to spring frosts and most fungous diseases but were late and susceptible to drought. The highest resistance to fungous diseases was found in specimens of *M. glutinosa* from Georgia and Dagestan; they were also frost resistant, leafy and quick in recovery. A single specimen of *M. trautvetteri* from the Altaĭ region displayed high resistance to drought and frost and more than average resistance to fungous diseases, combined with good hay yield in the first cut. Resistance to frost and fungous disease but susceptibility to drought were characteristic of *M. pubescens* from the Armenian steppes. Wild forms of *M. falcata* were later than Slavjanskaja Mestnaja and recovered more slowly but some of them are more resistant to drought, fungous diseases and spring frosts; those from the North Caucasus were the best and also gave high yields of leafy hay and of seeds; the Kubanj form has outyielded Slavjanskaja Mestnaja in many areas with low rainfall; these forms are regarded as specially promising as breeding material.

From the material studied, 23 selections of *M. sativa* and *M. falcata* have been released for cultivation. These include a Tibetan form with high and regular seed yields, a form of *M. falcata* from the Kubanj characterized by good yields of hay and seed under conditions of low rainfall, and two forms of *M. sativa* which have equalled Slavjanskaja Mestnaja in hay yield or exceeded it by up to 6%.

1380 Borkovskaja, V. A.
(Wild lucernes from the mountain regions of the Dagestan ASSR).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1953 : **30** : No. 2 : 156–63. [Russian].

In Dagestan the areas of several species of lucerne overlap and in the Gunib area forms have been found which show characters intermediate between *Medicago glutinosa* and *M. hemicycla*; in the progenies of these plants only one plant resembled *M. hemicycla*; some of the others gave progenies in which the presence of characters from the two species was clearly evident, though those of *M. glutinosa* were predominant; others gave progenies resembling *M. glutinosa* with no traces of hybridity. The author does not agree with attempts to establish this hybrid population as a separate species, *M. gunibica*. She also considers *M. virescens* to be only an ecotype of *M. glutinosa*. Hybrids between *M. difalcata* and *M. glutinosa* were not found, although the two species overlap, but hybrids between *M. hemicycla* and *M. difalcata*, whose areas do not overlap, were fairly frequent and gave progenies with the most varied combinations of the characters of the two species.

All plants of *M. glutinosa* examined cytologically had $2n = 32$; hybrids of *M. glutinosa* and *M. hemicycla* also had $2n = 32$; *M. hemicycla*, *M. coerulea*, *M. difalcata* and hybrids between *M. difalcata* and *M. hemicycla* all had $2n = 16$.

The highest yield of green matter per plant was given by *M. hemicycla*, some forms of which exceeded the standard lucernes by up to 40%. The hybrids between this species and *M. difalcata* also proved equal to the standards in yield in the first cut. The lowest yields were given by *M. glutinosa*, though some of its hybrids were somewhat better. All the wild species had lower seed yields than cultivated lucerne, the best again being *M. hemicycla* and its hybrids. The wild forms are very slow in recovery and usually give only one cut. Most of them have proved more resistant to rust than Slavjanskaja

but are not very resistant to mildew, the best in that respect being a form of *M. coerulea* from Botlih.

1381 Makus, A.
Aus der Arbeit der schwedischen Futterpflanzenzüchtung. (**From work in Sweden on forage plant breeding**).
Z. Pflanzenz. 1955 : **35** : 98–102.

A short account of breeding work being carried out on clovers and timothy at Svalöf and other centres in Sweden is presented. The red-clover variety Merkur has proved eminently suitable for cultivation in southern Sweden. It gives high yields and is winter hardy and resistant to *Sclerotinia trifoliorum* and the clover eelworm. It is not, however, suitable for cultivation in northern Sweden, where it loses its resistance to *S. trifoliorum* and eelworm. Attempts are being made to produce highly productive polyploid strains of red clover and Alsike. The timothy variety Omnia has proved superior to all others grown in the country.

1382 Thomas, H. L.
Inbreeding and selection of self-fertilized lines of red clover, *Trifolium pratense*.
Agron. J. 1955 : **47** : 487–89.

Self-pollinated seed was obtained by covering several branches at a time with large cotton bags and rolling the flowers between the fingers at intervals during the flowering season. Selfing has so far been carried to the S_2 generation and it is hoped eventually to produce inbred lines which may be combined to give hybrid vigour. No increase in self fertility resulted from X-irradiating open-pollinated seed of three varieties.

1383 Vestad, R.
Kløverråte (*Sclerotinia trifoliorum* Erikss.) på rødkløver i Norge. [**Clover stem rot (*S. trifoliorum* Erikss.) on red clover in Norway**].
Forskn. Fors. Landbr. 1955 : **6** : 359–78.

The results of experiments on varietal resistance to artificial inoculation and to infection under field conditions at the Institute of Genetics and Plant Breeding of the Agricultural College of Norway are presented. Tetraploid strains tended to be resistant and the diploid family $F261_{40}$–O_{112}–O and the diploid variety Vidarshov II also showed good resistance. The Swedish variety Merkur and the Danish variety Øtofte halvsildig [Øtofte Semilate], which are resistant in their native countries, proved susceptible in the Norwegian trials.

1384 Stammeforsøg med hvidkløver 1950–1954. (**Strain trials of white clover, 1950-54**).
Tidsskr. Planteavl. 1955 : **59** : 357–60.

Information is provided on the yield of dry matter and the content of crude protein of 13 strains tested on different soil types at six Danish stations.

1385 Stammeforsøg med alsike og kællingetand 1951–1954. (**Strain trials of alsike clover and birdsfoot trefoil, 1951-54**).
Tidsskr. Planteavl 1955 : **59** : 361–64.

A summary of the investigations published in this report appeared in *PBA*, Vol. XXV, Abst. 3143.

1386 Brewbaker, J. L.
Studies of oppositional allelism in *Trifolium nigrescens*.
Hereditas, Lund 1955 : **41** : 367–75.

T. nigrescens ($2n = 16$) was found to be highly self incompatible. Data on F_1 and F_2 families indicated that incompatibility was controlled by a system of oppositional *S* alleles, pollen reaction being of the gametophytic type. Self-compatible autotetraploids were obtained in an F_2 population derived from self-incompatible clones in which the chromosome number had been doubled by colchicine treatment. This self compatibility is ascribed to interaction of the competitive type in heterogenic pollen grains.

1387 Zalkind, F. L.
(**Breeding and seed production of vetch**).
Zemledelie (Agriculture) 1955 : No. 8 : 77–81. [Russian].

Mention is made of high-yielding local populations and cultivated varieties that have recently been made standards in the USSR. However, in the Nonchernozem Belt all these varieties are too late in maturing to be of any use for seed production, even though such varieties as Ljgov 31–292 may yield large amounts of green matter. It is thought that varieties adapted to cultivation in the Nonchernozem Belt can only be obtained by hybridization. In this connexion reference is made to a hybrid obtained at Belaja Cerkovj by crossing some Ukrainian material with early forms from Asia Minor. It is 5–8 days earlier than Ljgov 31–292 but is of no practical value as it is susceptible to spring drought. A very early Transcaucasian form is also mentioned.

1388 Geljčinskaja, R. B.
(Biochemical investigations on species and varieties of vetch).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1953 : **30** : No. 2 : 190–201. [Russian].

Variations in protein content according to year and locality were greater in varieties bred recently than in old-established varieties and species. Certain varieties of *Vicia sativa* are mentioned as outstanding in protein content, with over 24% of protein in the dry weight, giving 72 g. of protein per square metre. Equally high yields were obtained from *V. villosa* and although they were lower in yield of hay certain forms of *V. ervilia* had protein contents of almost 28·5% of the dry weight. In this latter species and in *V. monanthos* the proteins in the ripe seed were largely water soluble, whereas in *V. sativa* and other species they were salt soluble. *V. angustifolia* was the richest in arginine, tyrosine and tryptophane and the protein of all the vetch species examined proved rich in arginine, histidine and methionine, though all were rather low in lysine.

1389 Klimov, L.
(Seed production of spring vetch should be improved).
Kolhoz. Proizvod. (Collect. Fm. Prod.) 1955 : No. 11 : p. 27. [Russian].

A productive variety, with variegated seed, grown in the Kamenka district, Penza province, is mentioned. It outyields the standard Ljgov 31–292.

1390 Bates, R. P.
Studies of inheritance, photoperiodic response, and determination of tannin content in *Lespedeza cuneata* Don.
Abstr. Diss. Univ. Md. 1955 : **8** : No. 2 : p. 6. (Abst).

According to data on progeny obtained from seed produced by chasmogamous flowers of three crosses of *L. cuneata*, tannin content, plant height and seed production were highly complex in their mode of inheritance, whereas time of maturity and flower and plant colour were less complex. Inheritance of seed size and colour appeared to be fairly simple. In the F_2, flower colour was significantly correlated with plant colour, and time of maturity with seed size and colour. F_2 phenotypic variances for time of maturity and plant and flower colour were controlled approximately 90% by heritable factors; heritability of seed size was 85% and that of tannin content, plant height and seed production ranged from 35 to 55%. Photoperiods of 8, 10 and 12 hr. resulted in reduced growth and seed production, mostly cleistogamous seed being obtained. The greatest amount of seed was produced with a day length of 13 hr. In general, tannin content increased with day length. Strain differences in reaction to short and long photoperiods were noted. Techniques found satisfactory for evaluating the tannin content of strains and single plants are described.

1391 Bates, R. P. & Henson, P. R.
Studies of inheritance in *Lespedeza cuneata* Don.
Agron. J. 1955 : **47** : 503–07.

From a study of eight different characters in the F_2 generations of three crosses involving five varieties, it appeared that heritability of tannin content was about 40%, of plant height about 55–60%, of time of maturity about 90%, of flower colour about 92%, of plant colour about 90%, of seed size 75–91% and of the percentage of seed produced by chasmogamous, as distinct from cleistogamous, flowers about 36%. Tannin content appeared to be governed by 20–25 gene pairs, plant height by 34 pairs in one cross and by 13 in another, time of maturity by 22 and by 10 respectively in two different crosses, flower colour by about 10 gene pairs, plant colour by 12–16 pairs, seed size by about 4 pairs, the proportion of seed from cleistogamous flowers by 58–102 pairs and purple seed colour by a single gene pair. Flower colour was strongly correlated with plant colour and showed some association with seed colour. Seed colour and tannin content were associated in one cross, plant height was negatively correlated with time of maturity and seed size in another cross and there was evidence of an association between time of maturity, seed colour and seed size.

1392 Donnelly, E. D.
The effects of outcrossing on forage and seed yields in sericea lespedeza, *L. cuneata*.
Agron. J. 1955 : **47** : 466–67.

At the Alabama Agricultural Experiment Station, progeny from chasmogamous, i.e. selfed or cross-pollinated, flowers of ten randomly chosen plants of commercial *Lespedeza cuneata* gave an average of 25% more dry herbage and 40% more seed than the progeny of cleistogamous, i.e. self-fertilized only. Considerable differences both in forage and seed yields and in persistence occurred among the ten families. A breeding method utilizing heterosis for increasing seed and forage production is advocated.

1393 Hackbarth, J. & Troll, H.-J.
Einige Spontanmutationen von *Lupinus luteus* und *Lupinus angustifolius*. (**Some spontaneous mutations in *L. luteus* and *L. angustifolius***).
Z. Pflanzenz. 1955 : **34** : 409–20.

Mutations affecting leaf colour, length and breadth, growth habit of the plant and colour of the testa are discussed with reference to the literature and tabular data on the mode of inheritance of the different mutants are presented. New mutations of *L. luteus* recently noted by the authors include a plant with yellowish-green leaves, designated *aureus*, and a chlorophyll-deficient albino, designated *albinus*. Both these characters are inherited as simple Mendelian recessives. A new recessive gene for alkaloid deficiency, designated *depressus*, has been discovered in *L. angustifolius* mut. *leucospermus*.

1394 Hackbarth, J.
Versuche mit Röntgenbestrahlung zur Mutationsauslösung bei *Lupinus luteus*, *Lupinus angustifolius* und *Lupinus albus*. (**Experiments on the induction of mutations in *L. luteus*, *L. angustifolius* and *L. albus* by X irradiation**).
Z. Pflanzenz. 1955 : **34** : 375–90.

The experiments described were conducted at the Scharnhorst branch of the Max Planck Institute for Breeding Research. Best results were obtained by soaking the seeds in water for 24 hr. and then exposing them to a dose of 10 kr. In the case of *L. albus*, which proved less sensitive to X irradiation than either of the other two species, exposure of the seeds to low temperatures for 48 hr. between soaking and X irradiation increased the percentage of mutations obtained. Leaf colour was the character most frequently affected in *L. luteus* and *L. angustifolius*, plants with yellow-green, olive-green, light-green, salmon-coloured and reddish leaves being obtained in the X_1. In all cases these changes in leaf colour appeared to depend upon a single recessive gene. In the X_2 of *L. luteus* a plant with floral abnormalities leading to a high degree of physiologically-conditioned sterility and a plant with shorter pods and producing fewer seeds than the parent variety were also found. In *L. albus*, a number of plants with short stems and dwarf habit were found in the X_2; a dwarf mutant of *L. angustifolius* was also found. Changes in growth period were observed in X-irradiated material of all three species, especially in the X_3 of *L. luteus*, and some of these mutants may be of economic value.

1395 Smirnova-Ikonnikova, M. I. & Veselova, E. P.
(**The aminoacid composition of the protein of lupin seeds**).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1953 : **30** : No. 2 : 179–82. [Russian].

The results of analyses presented show that the protein from seeds of low-alkaloid lupins contains the same aminoacids as the protein from peas, beans and lentils, except that it is somewhat lower in content of lysine. The sweet lupin Weiko was somewhat low in tryptophane. The content of histidine and lysine was greatest in *Lupinus luteus* and *L. polyphyllus* and these species are thus considered biologically the most valuable. The highest protein content was observed in *L. luteus*, in which values of up to 55·7% are reported.

1396 Smirnova-Ikonnikova, M. I. & Veselova, E. P.
(**Content and quality of protein in the seeds of recommended varieties of *Lathyrus sativus***).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1953 : **30** : No. 2 : 183–89. [Russian].

The analyses reported show that the seeds of *L. sativus* varieties grown in the USSR have a high protein content, varying from 23·94 to 31·70%; the proteins are of high biological value, containing histidine, lysine, tryptophane and methionine in suitable quantities.

ROOTS AND TUBERS

1397 Pajbjergfondens Forsøgs- og Forædlingsarbejde 1954. (**Experiments and breeding operations of the Pajbjerg Foundation, 1954**) : Pp. 40.

This report is devoted entirely to a review of the foundation's work on polyploid mangels and sugar beets during the past seven years. In numerous tests, tetraploids produced by colchicine treatment have proved lower yielding than diploids, while triploids produced by crossing tetraploids and diploids have proved higher yielding. Methods of obtaining high yields of triploid seed are discussed. In crossing tetraploids and diploids, a higher proportion of triploid seed was produced from tetraploid mother plants than from the reciprocal crosses. It has been shown that to obtain the highest possible proportion of triploid seed (50–70%), the seed-production field should contain 25% diploids and 75% tetraploids; the proportion of triploids may be further increased by removing diploid plants after flowering.

1398 SEDLMAIR [SEDLMAYR], K. & KELEMEN, A. O. (Translator)
(Directed improvement of vigour in cross pollinating plants).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) 1955 : Ser. biol. : No. 5 : 101–04. [Russian].

The author supports the views of Darwin, Lysenko and others concerning the deleterious effects of inbreeding and discusses the possibilities of increasing the amount of cross fertilization in cross-pollinated plants. One of the methods suggested is the use of selective fertilization, reference being made to some experiments made at Sopronhorpács in Hungary. In paired sowings of the mangel K405, 97% of the seed from the one parent and 95% from the other gave rise to hybrid seedlings, from which it is concluded that selective fertilization had been operative. With sowings of tetraploid and diploid beets the seed from the tetraploid gave 73% of hybrids and that of the diploid only 27%; sometimes the percentages were still less and the seed from a male-sterile parent gave only 50% hybrids instead of the expected 100%. The percentage of hybrids can be raised by adjusting the proportions between the parental forms; thus by planting one seed parent to four pollen parents 79·8% of hybrid seedlings were obtained in mangel and 99·5% in sugar beet.
In producing seed of the mangel Pink Beta four different biotypes, identical morphologically but genotypically distinct, are reproduced in different parts of the country and mixed together for producing seed of high vitality.

1399 KRASOČKIN, V. T.
(Initial botanical material of beet and carrot and the prospects of utilizing it in breeding).
Problemy Botaniki (Problems of Botany). Akademija Nauk SSSR : 1955 : **2** : 261–316. [Russian].

The improved varieties of table beet and carrot produced in the Soviet Union since breeding work started in 1920 are enumerated and briefly described, with indications of their merits and defects. The world collection at Leningrad comprises over 1600 specimens of beet and over 1000 of carrot, forms from 50 different countries in all five continents being represented. A study of the collection in many different localities has led to some slight modification of the taxonomy of the genus *Beta*, *B. maritima*, *B. cicla* and *B. orientalis* being regarded as distinct species. Thirteen species in all are recognized and are divided into three sections. The first section, *Patellares*, contains three species, *B. procumbens*, *B. webbiana* and *B. patellaris*, all resistant to nematode. The five species of section *Corollinae* are all perennials adapted to continental climates, and mostly to high altitudes; they are monogerm types, resist drought and frost and some of them give a high yield of roots, as in *B. macrorhiza* ($2n = 18$), which stands closest to the section *Vulgares*; this consists of five species, *B. patula*, *B. maritima* (including *B. macrocarpa* and *B. atriplicifolia*), *B. orientalis*, *B. cicla* and *B. vulgaris*. The European subspecies of *B. vulgaris* is thought to have arisen in the Near East and come to Europe through the Mediterranean countries during the Middle Ages, sugar beet having arisen later by crossing of the horticultural beets with *B. cicla* and the northern forms of *B. maritima*. The eastern group has the shortest vernalization stage and the Scandinavian group the longest. For the production of seeds, flowering can be stimulated in the first year of growth in all varieties at Leningrad by sowing in January in the greenhouse, keeping the seedlings for 70–80 days at low temperatures of from 6 to 10° C. and planting out in the middle of May.
The opinion is expressed that it should be possible to improve the yield of table beet varieties by crossing with mangels of the Eckendorf and Barres type and of carrots by crossing with the Loberich type; earliness could be improved by crossing beets with the Egyptian Extra-early and Early Wonder types and carrots with the Paris type. Species of section *Patellares* are of interest for producing beets resistant to nematodes, some of the Central Asian species for resistance to mosaic and to *Cercospora*. The capacity to grow at low temperatures can be increased by germinating seeds at 3–6° C. and selecting the seedlings for vigour of growth at this temperature; for frost resistance the cold-resistant forms of *B. corolliflora*, *B. trigyna* and *B. maritima* should be used, together with northern forms, such as Barres, with a long vernalization phase. *B. lomatogona* is interesting for drought resistance but is difficult to cross; the local cultivated beets of Central Asia and Asia Minor are probably of more use; some of the carrots from Central Asia are useful for the same purpose. Quality in beets can be improved by selection for sugar and vitamin content and consistency of flesh, and in carrots for reduced heart and better root conformation; by crossing with a round white beet from Iran the dry-matter content of beets was raised considerably, some segregates in the progenies from repeated back crossing with sugar beet having a dry-matter content of 23–24%; from them a new

form has been selected which is distinguished by a round root with 14–16% sugar and 20–24% dry-matter content and matures earlier than sugar beet in northern latitudes; it has been named Sweet Round. The sugar content in carrots has been raised by 2–3% by selection alone.

1400 FIEDLER, J.
Československé odrůdy krmných řep v zahraničí. (**Czechoslovakian mangel varieties beyond the state frontiers**).
Za socialist. Zeměd. 1955 : **5** : 1234–41.
Data on yield and dry matter content of some Czechoslovakian mangels tested in France, Austria, Switzerland and Western Germany are presented.

1401 KRESS, H.
Sortenwertlinien und Anbauzonen. (VI. Teil: Futter- und Zuckerrübensorten). (**Varietal evaluation curves and zones of cultivation. Part VI. Mangel and sugar beet varieties**).
Dtsch. Landw., Berl. 1955 : **6** : 379–84.
The relationship between variety and environment was studied at a number of centres in Eastern Germany during 1948–53 and, on the basis of these observations, recommendations are made as to the varieties most suitable for cultivation under the various climatic conditions of the East German Republic. Diagrams are provided in which the zones of optimum cultivation of the different varieties tested are delineated.

1402 OLEĬNIKOVA, T. V.
(**Characteristics of the phasic development of biennial root crops**).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1953 : **30** : No. 2 : 164–78. [Russian].
A report is given of experiments with turnips and swedes which showed that varieties differed in the length of the vernalization stage and under certain conditions variations were observed between individuals within a variety. Varieties differed also in the temperature required for vernalization, southern varieties such as the Milan turnip being capable of effecting the vernalization stage after treatment at + 10° C. whereas northern varieties required + 5°, + 3° or lower. The varieties differed in the length of the light stage too, the longest being found in the varieties from the extreme north and the shortest in a local turnip from the Uzbek SSR; this turnip also had the shortest vernalization stage.

1403 BABIČEV, I. A.
(**Chemical composition of cruciferous roots and influence of manuring upon it**).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1953 : **30** : No. 2 : 202–14. [Russian].

Figures are given showing the chemical composition of a number of varieties of turnip and swede; the highest dry matter content was observed in the turnip Maĭskaja [May] with 16·94% of dry matter, 6·60% sugars and 43·3 mg. % vitamin C per fresh weight near Leningrad in 1947–48; further north the dry matter content was somewhat less but the vitamin C rather higher. Balanced manuring increased the yield but on the whole reduced the dry-matter content, though different varieties and species reacted slightly differently in this respect.

1404 BABIČEV, I. A.
(**Invertase activity and qualitative composition of the sugars in root crops**).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1953 : **30** : No. 2 : 215–18. [Russian].
Differences in invertase activity were observed between varieties of turnip, swede, beet and carrot and were correlated with the type of sugars, forms with high invertase activity having mainly reducing sugars and those with low activity mainly sucrose.

1405 KELLER, E. R.
Das schweizerische Richtsortiment im Kartoffelbau 1955/56. (**The Swiss official variety list for potato growing, 1955/56**).
Mitt. schweiz. Landw. 1955 : **3** : 145–53.
Data are presented on the yielding capacity, quality, soil requirements, morphological characteristics and disease resistance of the 17 varieties now included in this list.

1406 RIEMAN, G. H. & SCHULTZ, J. H.
Red Beauty: a new bright-red medium-maturing variety of potato, resistant to *Verticillium* wilt.
Amer. Potato J. 1955 : **32** : 346–49.
In addition to the above characters, Red Beauty has white flesh, smooth and attractively shaped tubers, good cooking quality and tolerance of purple-top wilt. It retains its red colour in storage and is especially adapted to sandy soils. It is susceptible to rugose mosaic and scab.

Released by the Wisconsin and North Dakota Agricultural Experiment Stations, it was developed from a cross between seedling ND1 (Min. 80–7 x Min. 11–1–3–2) and Cayuga (Hindenburg x Katahdin).

1407 Black, W. & Cockerham, G.
Potatoes. Wild plants keep this crop prolific.
Agric. Rev., Lond. 1955 : **1** : No. 4 : 20–28.

A short historical survey of breeding is given, chiefly with reference to varieties in Britain and to breeding for disease resistance, emphasis being laid on the use of *S. demissum* in developing late-blight resistant varieties and of *S. andigenum* as a source of resistance to eelworm.

1408 Cullen, J. C.
Second early potato variety trials, 1946-1953.
J. nat. Inst. agric. Bot. 1955 : **7** : 320–40.

Data are given on the yield, incidence of disease and other defects, rapidity of sprouting, recovery from frost damage, maturity and other characters of Craigs Alliance, Craigs Royal, Ulster Emblem and Ulster Ensign in comparative trials with established varieties at 15 centres in England.

1409 Filippov, A. S.
(**Achievements in potato breeding**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1955 : No. 10 : 88–90. [Russian].

A number of good Soviet varieties, including wart-resistant and *Phytophthora*-resistant forms bred in recent years in White Russia, Estonia and Latvia, are mentioned. Reference is made to Mičurinist methods used at various research stations and to some new forms so obtained at the Potato Institute. These are characterized by high yield, disease resistance and tolerance of low temperatures.

1410 Rigot, N.
Les obtentions belges en pommes de terre. (**Potatoes produced in Belgium**).
Rev. Agric., Brux. 1955 : **8** : 1290–97.

Descriptions are given of five new varieties bred at the Libramont Experiment Station. Crésus is a very early variety producing high yields of long tubers with shallow eyes, yellow skin and pale yellow flesh. The plants, which tuberize early, possess good resistance to *Streptomyces scabies* and *Synchytrium endobioticum* and moderate resistance to virus diseases. The cooking quality of this variety is well above that of most early potatoes at present grown in Belgium. Dalila is a medium-early variety producing moderately high yields of tubers of extremely good quality. The tubers are fairly resistant to *Phytophthora infestans* but the foliage is susceptible. This variety, which has shallow eyes and yellow flesh and skin, requires soil of good fertility to grow well. It possesses good resistance to *Synchytrium endobioticum* and *Phoma tuberosa*. Électre matures a few days later than Eigenheimer, possesses good resistance to virus diseases, *Phytophthora infestans* and *Synchytrium endobioticum* and produces good yields of tubers with a high dry-matter content. The tubers are round and uniform in shape, have yellow flesh and skin and keep well. Électre prefers soils of good fertility and requires ample moisture. Eschyle, a late-maturing variety possessing good resistance to *Phytophthora infestans*, virus diseases, *Phoma tuberosa* and *Synchytrium endobioticum*, produces high yields on fertile soils and is resistant to drought. It has a high dry-matter content, pink skin and yellow flesh. The cooking quality of the tubers, which are of medium size, is good. Érato, also a late-maturing variety, is highly resistant to virus diseases, particularly leaf roll. It is slightly susceptible to *Phoma tuberosa* and *Corticium solani*. The skin and the flesh are yellow. The cooking quality of the tubers is good but the keeping quality poor. This variety produces heavy yields of large, longish tubers even under dry conditions.

1411 Vereinigung Schweiz. Versuchs- und Vermittlungsstellen für Saatkartoffeln (V.S.V.V.S.). Bericht über die Hauptversuche mit neuen Kartoffelsorten im Jahre 1954. [**Association of Swiss Experimental Stations and distributive agencies for seed potatoes (VSVVS). Report on the principal trials of new potato varieties in the year 1954**]. 1955 : Pp. 27. (Mimeographed).

The results of three sets of experiments at several localities are given (cf. *PBA*, Vol. XXV, Abst. 2122) and, in addition to the data presented below, information on morphological characteristics, cooking quality and resistance to virus, *Streptomyces scabies*, internal rust spot, black heart, hollow heart, *Phytophthora infestans*, *Synchytrium endobioticum*, *Rhizoctonia solani* and *Alternaria* sp. is presented for each variety tested. The first series of trials included mid-early to midlate industrial and dual-purpose varieties. Augusta, followed by Voran [Onwards], gave the highest yields; Voran produced the most starch per acre and Falke [Falcon], Urtica and Panther had the highest starch content. Panther, Falke and Voran were

the most resistant to late blight but Voran proved highly susceptible to leaf roll. Augusta displayed the most rapid and vigorous vegetative growth. Panther and Augusta were comparatively resistant to common scab. Susceptibility to *Spondylocladium atrovirens* was pronounced in varieties with a high starch content. In the midlate to late group, Benedikta, Capella and Ackersegen were the most productive. Capella and Adelheid had the highest starch content and Capella gave the highest yields of starch per given area. Adelheid, Capella and Ackersegen proved comparatively resistant to late blight. In trials of varieties for human consumption, Bintje was the most productive, despite its susceptibility to late blight, and also had the highest starch content of all the varieties tested in this group. Kerpondy and Ulster Supreme were the least susceptible to late blight.

1412 Montalvo, R.
Comparativo de selecciones clonales de papa en la Sierra Central. (**Comparison of clonal selections of potato in the Central Sierra**).
Inf. mens. Estac. exp. agríc. La Molina 1954 : Octubre : 1–4. (Mimeographed).

Certain clonal selections of the variety Casa Blanca gave yields of over 40,000 kg. of tubers per ha. in Peru, being relatively free from attack by *Phytophthora infestans* and the noctuid *Premnotrypes solani*.

1413 Quevedo Díaz, A.
Cruces intervarietales de papa, 1952 á 1954. (**Intervarietal crosses of potato, 1952-54**).
Inf. mens. Estac. exp. agríc. La Molina 1954 : Octubre : 9–18. (Mimeographed).

Seedlings have been selected from the crosses Casa Blanca x Maco and Ticanel x Huagalina; in view of the resistance of Ticanel to the common race A of *Phytophthora infestans* it is expected that some of the seedlings may be resistant.

1414 Quevedo Díaz, A. & Montalvo, R.
Comparativo de variedades y seedlings de papa. (**Comparison of potato varieties and seedlings**).
Inf. mens. Estac. exp. agríc. La Molina 1954 : Diciembre : 6–11. (Mimeographed).

Among the varieties tested, Huasahuasi gave the highest yield with 11,270 kg. per ha. Selfed seedlings of it gave notably less yield.

1415 Katin-Jarcev, L. V. & Ivanova, L. T. (**An experiment on the production of early potato varieties**).
Agrobiologija (Agrobiology) 1955 : No. **4** : 79–86. [Russian].

The 1953 standards, Severjanin [Northern] and Sedov, and other recent early selections from Omsk were derived from Rannjaja Roza 1830 [Early Rose 1830] x Katahdin. The above standards outyield Rannjaja Roza 1830 and produce large shallow-eyed tubers with good keeping properties. Sedov is the more productive of the two, but Severjanin has more compact tuber clusters and a better flavour. Reference is also made to the productive midseason table varieties Sibirjak, bred from some Kazah material, and Omič [Omsk Dweller] (Citrus x Hindenburg). The latter has so far shown resistance to wart.

1416 Swaminathan, M. S.
Overcoming cross-incompatibility among some Mexican diploid species of *Solanum*.
Nature, Lond. 1955 : **176** : 887–88.

In experiments at the Inter-regional Potato Introduction Station, Sturgeon Bay, Wis., the ordinary technique of hybridization was successful only in the case of *S. pinnatisectum* x *S. polyadenium*. In crosses of *S. pinnatisectum* ♀ with *S. bulbocastanum* and *S. lanciforme* the pollen showed little or no germination. Hybrids were however obtained from both combinations by removing the stigma and a small portion of the style from the flowers of *S. pinnatisectum* and applying an agar-sucrose-gelatin medium to the decapitated surface before pollination.

1417 Gottschalk, W. & Peters, N.
Die Chromosomenstruktur diploider Wildkartoffel-Arten und ihr Vergleich mit der Kulturkartoffel. Ein Beitrag zum Abstammungsproblem der Kartoffel. (**The chromosome structure of diploid wild potato species and its comparison with the cultivated potato. A contribution to the problem of the origin of the potato**).
Z. Pflanzenz. 1955 : **34** : 351–74.

The pachytene chromosomes of 11 tuber-forming wild species were analysed and compared with the pachytene chromosomes of *Solanum tuberosum* to obtain information on the relationships between wild and cultivated species and between the different wild species. *S. stenotomum* appeared to be the wild species most closely related to the cultivated potato, 10 of the 11 chromosomes identified being identical or nearly

identical morphologically with the corresponding chromosomes of *S. tuberosum*. The other species varied in the number of chromosomes they had in common with *S. tuberosum*, ranging from 9 in the case of *S. berthaultii* to 4 in the case of *S. simplicifolium*. It is concluded from the cytological findings that *S. stenotomum*, *S. andigenum* and *S. tuberosum* are derived from a common ancestral form; the putative interrelationships between the other species are also outlined. Evidence was also found in support of the hypothesis that *S. simplicifolium*, *S. ajanhuiri*, *S. berthaultii*, *S. polyadenium* and *S. rybinii* are natural tetraploids.

1418 Ratera, E. L.
Número de cromosomas de algunos *Solanum* (*Tuberarium*) argentinos. [**Chromosome numbers of some Argentine species of *Solanum* (*Tuberarium*)**].
Rev. Fac. Agron. B. Aires 1954 (1955) : **13** : 470–73.

Chromosome numbers are given for 29 species of *Solanum* which occur wild in Argentina, indications being given of their geographical distribution within the country. The majority of the species are diploid, in *S. millanii* clones with both $2n = 24$ and $2n = 36$ occur, three other species are triploid and three tetraploid. Species belonging to series *Commersoniana* are the most common.

1419 Gilles, A.
Recherches cytogénétiques sur les *Solanum* (Section *Tuberarium*) 1. Nombres chromosomiques et associations méiotiques. [**Cytogenetical investigations on *Solanum* (Section *Tuberarium*) 1. Chromosome numbers and associations at meiosis**].
Cellule, Louvain 1955 : **57** : 7–31.

The results of cytogenetic investigations of wild potato species from Central and South America at the Libramont Experimental Station, Belgium, are reported. Tabulated data on the chromosome numbers of 43 species are presented, including the following: *S. longiconicum* ($2n = 48$); *S. pinnatisectum* ($2n = 24$); *S. setulosistylum* ($2n = 48$); *S. de bogota* ($2n = 24$); *S. curao* ($2n = 24$) and a line of *S. vallis-mexici*, with $2n = 72$. A study of primary and secondary associations in *S. polyadenium*, *S. chacoense*, *S. tuberosum*, *S. andigenum*, *S. acaule*, *S. antipoviczii*, *S. longipedicellatum* and *S. demissum* showed that primary associations and multivalents in both diploid and tetraploid species were more frequent at the beginning of diakinesis than at the end, and were absent in metaphase I. It is suggested that the basic chromosome number of the genus is probably lower than 12, 6 being considered the most likely number.

1420 Steineck, O.
Untersuchungen über die photoperiodische Reaktion einiger Kartoffelsorten. (**Investigations on the photoperiodic reaction of some potato varieties**).
Bodenkultur 1955 : **8** : 254–62.

Experiments carried out at the Institute for Horticulture and Plant Breeding, Vienna, substantiated the hypothesis that most potato varieties are day-neutral. In the first set of experiments, plants of the varieties Bintje and Saskia were subjected to an eight-hour photoperiod. Compared with the controls they exhibited a reduced rate of growth and their foliage was stunted. They failed to flower and their tuber and foliage yields were between one third and one half of those of the controls. In the second set of experiments, plants of the varieties Erstling, Sieglinde, Bintje and Ackersegen were submitted to 12-hour and 14-hour photoperiods. All varieties gave reduced yields of foliage and tubers compared with the controls, the effect of short-day conditions being considerably more pronounced in plants subjected to a 12-hour than a 14-hour photoperiod. Varietal differences were observed in the extent to which reduced day length affected yield, the 12-hour photoperiod causing a loss in tuber yield of only approximately 10% in the case of Erstling and Sieglinde whereas reduction in yield in the case of Bintje and Ackersegen amounted to nearly 40% compared with the controls. In the third set of experiments, the photoperiodic responses of Jakobi and of so-called bolter strains of Erstling with short-day response were ascertained. Plants of the variety Jakobi exhibited typical short-day characteristics; their yield of tubers when grown under a 12-hour photoperiod was three times as high as when they were cultivated under normal conditions. The short-day Erstling strains are assumed to be mutants of the normal form (cf. *PBA*, Vol. XXIV, Abst. 3112).

1421 Szalai, I.
Néhány burgonyafajta nyugalmi állapotának megrövidítéséről. [**Shortening the dormant period of some potato varieties**].
Magyar TudEgyetem. biol. Intéz. Évkön. 1951 : **1** : 419–46.

The effect of combined low temperature and chemical treatment (in particular ethylene chlorhydrin) on dormant tubers of four varieties

was investigated. The varieties differed in the degree of temperature, concentration of chemical and duration of treatment most effective in breaking dormancy.

1422 Mohamed Aslam Zafar
Application of certain hormones to prevent flower abscission in two potato (*Solanum tuberosum*) varieties.
Amer. Potato J. 1955 : **32** : 283–92.

In connexion with hybridization, experiments were carried out on the effects of the following hormones upon flowering and fruit set in the varieties Canoga and Russet Burbank: 2,4-dichlorophenoxy acetic acid (2,4-D); 2,4,5 trichlorophenoxyacetic acid (2,4,5-TCPA); α-2,4,5 trichlorophenoxyacetic propionic acid (2,4,5-TCPP); p-chlorophenoxyacetic acid; α-naphthaleneacetic acid (NAA); indolebutyric acid (IBA); and o-chlorophenoxyacetic acid. The hormones were applied by spraying with 25 p.p.m. aqueous solutions at the tuber, four-inch, fully grown and flower-bud stages. In Canoga, flowers and fruits were formed with all treatments, the best results being obtained by applying 2,4-D at the fully grown stage, followed by IBA, 2,4,5-TCPA and 2,4,5-TCPP in descending order of effectiveness. To obtain adequate flowering and fruit set in Russet Burbank, more selectivity with respect to stage and hormone was required, application with NAA and 2,4,5-TCPP at the 4-inch stage being the most satisfactory.

1423 Sanz de Cortázar, C.
Influencia climatérica sobre al polen de papa. (**Climatic influence on potato pollen**).
Agricultura téc., Santiago 1954 : **14** : 5–10.

Out of 262 potato varieties studied in Chile, 78·6% proved unsuitable for use as pollen parents. Five typical varieties grown in different parts of the country showed certain differences in the amount of good pollen; the differences were not correlated with temperature or rainfall but showed a certain correlation with air humidity.

1424 Rebour, H.
Pommes de terre de qualitée. (**Potatoes of quality**).
Rev. agric. Afr. N. 1955 : **53** : 587–89.

The varieties Belle de Locronan [Locronan Beauty], BF15, Kerpondy and Viola are described briefly and recommended for cultivation in Algeria and Morocco on account of their good cooking quality.

1425 Bukasov, S. M.
(**Systematics of potato species**).
Problemy Botaniki (Problems of Botany). Akademija Nauk SSSR : 1955 : **2** : 317–26. [Russian].

The author considers that *Solanum trifida* should be included in the group *Bulbocastana*, that *S. polyadenium* should be removed from the group *Pinnatisecta* and placed in a separate group *Polyadenia*, and that *S. cardiophyllum* and *S. coyoacanum* should also be removed from *Pinnatisecta*, as should all species of the group *Commersoniana*. Descriptions are given of the series *Commersoniana, Glabrescentia, Cuneolata, Alticolae, Acaulia, Tuberosa, Etuberosa, Andigena, Conicibaccata, Andreana, Juglandifolia, Demissa, Longipedicellata, Cardiophylla, Bulbocastana, Oxycarpa, Polyadenia* and *Pinnatisecta* and the species comprising them. A brief description is given also of the new species created by Hawkes (cf. *PBA*, Vol. XIV, p. 269). The author does not agree with Hawkes in combining the two species *S. andigenum* and *S. tuberosum* and considers *S. sandemanii* to be related to the group *Angustisegmentata* (*S. punoense*?) rather than *Tuberosa*.

1426 Filippov, A. S.
(**Mičurinist theory and its utilization in potato breeding**).
Agrobiologija (Agrobiology) 1955 : No. 5 : 32–44. [Russian].

An account of potato breeding in the USSR, with special reference to the achievements of the Potato Institute, is given. Good varieties bred in recent years, including the *Phytophthora*-resistant variety Moscow, the wart-resistant Peredovik [Advanced] and Soviet, which is distinguished by a high starch content, are described. Data on the yield, starch content and growth period of a number of hybrids that are still under trial are presented. Many of these are characterized by tolerance of frost and disease resistance. By training varieties and hybrids upon certain soils and supplying them with suitable fertilizers, heritable changes have been obtained in morphological characteristics, yield, disease resistance and length of growth period. Rannjaja Roza [Early Rose], grafted on F_1 (Kalitinec x Katahdin), imparted good tuber production to the stock and to subsequent tuber generations. Similar directed changes due to grafting have been obtained in respect of starch content, length of growth period and other properties. Among the heritable changes produced by grafting domestic varieties upon *Solanum schreiteri* and *S. demissum* were shortening of the stolons and

improved tuber yield. Vegetative rapprochement has been used with good effect to overcome incompatibility in crosses of *S. demissum*, *S. schreiteri* and *S. punae* with domestic varieties.

1427 Mastenbroek, C.
Nachtvorstresistentie in toekomstige aardappelrassen? (**Resistance to night frost in future potato varieties ?**)
Meded. Nat. Coöp. Aan- Verkoopver. Landb. Cent. Bur. 1954 : **38** : 75–76.

Results achieved in the Netherlands by crossing *S. acaule* ($2n = 48$) with cultivated varieties are reviewed briefly. This wild species, which is resistant to temperatures of down to −8° C. in its natural habitat, does not cross readily with *S. tuberosum* but fertile hybrids have been obtained both by doubling the chromosome complement of the wild species prior to crossing and by using other wild material as a bridging species. The frost resistance of *S. acaule* is inherited as a dominant character in crosses with *S. tuberosum* and appears to depend upon several independently inherited genes. Some hybrid clones bred in the Netherlands were resistant to −5° C. for short periods under laboratory conditions and suffered no damage in the field when the temperature sank below −3° C. In addition, one series of hybrid clones gave higher yields of tubers than the *S. tuberosum* parent, suggesting that *S. acaule* contains masked genes for yield which become active in combination with genes from *S. tuberosum*. There was no indication that frost resistance in the hybrids was in any way linked with undesirable characteristics.

1428 Calderoni, A. V. & Induni, C. J.
Resistencia de variedades y clones de papa a la sarna común (*Streptomyces scabies*). [**Resistance of potato varieties and clones to common scab (*S. scabies*)**].
Rev. Invest. agríc. B. Aires 1954 : **8** : 195–99.

This is the full report of the work referred to in *PBA*, Vol. XXIV, Abst. 2131. It is pointed out that all four resistant varieties have russet tubers.

1429 Hoffmann, G. M.
Zur Methodik der Schorfresistenzprüfung von Wildkartoffeln. (**On a technique for testing wild potatoes for resistance to scab**).
Phytopath. Z. 1955 : **24** : 465–68.

The method described consists of repotting plants in such a way as to allow some of the stolons to hang over the side of the pot. They are then immersed in two test tubes, one containing spores of *Streptomyces scabies* in suspension and the other acting as control. The method described in *PBA*, Vol. XXV, Abst. 1196 has proved suitable only for testing cultivated varieties.

1430 Quevedo Díaz, A. & Montalvo, R.
Estudio de resistencia al hielo fungoso en papa. (**Study on resistance to late blight in potatoes**).
Inf. mens. Estac. exp. agríc. La Molina 1954 : Diciembre : 1–5. (Mimeographed).

Seedlings of *Solanum antipoviczii* x (*S. andigenum* x *S. yabari*) that had given resistant reactions in greenhouse tests also proved resistant in the field. Lines yielding 334, 306 and 227 g. of tubers per plant were selected.

1431 Graham, K. M.
Distribution of physiological races of *Phytophthora infestans* (Mont.) de Bary in Canada.
Amer. Potato J. 1955 : **32** : 277–82.

A gene conferring resistance to race 0 of *Ph. infestans* was found in *Lycopersicon esculentum* var. *cerasiforme* 'Geneva T–5'. In crosses with the susceptible tomato Stokesdale, this gene behaved as a simple dominant. The gene was designated R_1^t and Geneva T–5 was included among the hosts used to differentiate races of the pathogen. Stokesdale was included under the genotype r^t. Using these two varieties and potato differentials, 70 isolates from 9 provinces were grouped into 8 races, 0, 1^t, 1, 1.2, 1.4, 4, 1.2.4 and $1^t.4$, according to the international system of nomenclature proposed by Black *et al.* (cf. *PBA*, Vol. XXIV, Abst. 2168); the so-called common race was found to consist of races 0 and 4, which may be isolated alone or together; two isolates were mixtures of 1^t and $1^t.4$. It is suggested that *Ph. infestans* is heterocaryotic and that both the natural hosts and artificial culture media may exert a selective influence upon components of the common race. After isolation from single zoospores, pure lines of several races have been maintained for a considerable period on oatmeal agar without alteration in virulence.

1432 Wilson, J. B. & Gallegly, M. E.
The interrelationship of potato and tomato races of *Phytophthora infestans*.
Phytopathology 1955 : **45** : 473–76.

Twenty-nine isolates of *Ph. infestans*, behaving as ten races on potato hosts, fell into four groups when tested on differential tomato hosts: I, weakly pathogenic to nonpathogenic on all

varieties; II and III, pathogenic on varieties with recessive genes for resistance but not on those with multiple or dominant genes, the two groups differing only in degree of virulence; and IV, pathogenic on all tomatoes. When tested on differential potato hosts, sixteen isolates comprising three tomato races of the pathogen reacted as potato races 0, 3 and 4. With both sets of isolates it was found that different isolates behaving as one race on the one host species may react as different races on the other species.

1433 Müller, K. O., Cullen, J. C. & Kostrowicka, M.
Testing "true resistance" of the potato to blight, *Phytophthora infestans*.
J. nat. Inst. agric. Bot. 1955 : **7** : 341–54.

Methods of testing varieties and seedlings for resistance due to hypersensitivity are described. In testing any one variety the reactions of the different plant parts should be determined in the laboratory and glasshouse and the findings supplemented by field tests.

1434 Ferris, V. R.
Histological study of pathogen-suscept relationships between *Phytophthora infestans* and derivatives of *Solanum demissum*.
Phytopathology 1955 : **45** : 546–52.

This is a detailed account of work reported in *PBA*, Vol. XXV, Abst. 2181.

1435 Bukasov, S. M.
(Production of wart-resistant potato varieties).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1955 : No. 10 : 90–93. [Russian].

An account of breeding for resistance, mainly in the USSR, where research began in 1927–1928, is given. The initial crosses involving wart-resistant material were made at the Institute of Plant Industry and at the Potato Institute. Next came introductions of such wart-resistant varieties as Berlichingen, Ostbote [Eastern Messenger] and Majestic. Later still these were superseded by Soviet-bred varieties resistant to wart. Thirty of these are listed but they are stated to be only a fraction of those now available and it is said that the greater part of recent Soviet standard varieties are wart-resistant. The modern trend is to test material for resistance at an early stage of selection; a serological method devised by Fedotova is suitable for this purpose. The fact that some recently produced wart-resistant varieties (Stärkeragis, Isolde, Bona and Viola) have in their parentage at least one component whose wart resistance had not previously been tested, is deplored. It is stated that the percentage of wart-resistant plants among the progeny of a selfed susceptible variety or of a hybrid of susceptible x susceptible varieties is low. Crosses between susceptible and resistant varieties give 50–85% hybrids showing resistance; hybrids between resistant varieties are up to 100% resistant. The percentage of wart-resistant plants on selfing a resistant variety is over 75%. At the Institute of Plant Industry the percentages of wart-resistant types obtained in interspecific crosses of the following domestic varieties were as follows: Priekuli 50–100%, Frühmölle 40–100%, Ballydoon 50–100%, Oktjabrenok 0–100%, Catriona 85%, King George 75% and Gladstone 96·5–100%. Stärkeragis, which is used in breeding for improved starch content, imparts wart resistance to 34–90% of its progeny. Experiments on *Solanum tuberosum* varieties and hybrids and other species and forms of *Solanum* suggest that resistance is dominant to susceptibility. For instance, a resistant form of *S. leptostigma* gave 57–100% resistant progeny when crossed with six susceptible domestic varieties. On the other hand, all progeny were susceptible in the cross of a susceptible form of *S. curtilobum* with the susceptible varieties Epicure and Korenevskiĭ. Many forms belonging to the wild species *S. demissum*, *S. acaule*, *S. jamesii*, *S. antipoviczii*, *S. commersonii*, *S. chacoense*, *S. molinae* and *S. leptostigma* are wart-resistant, as are cultivated forms of the following species: *S. andigenum*, *S. phureja*, *S. stenotomum*, *S. boyacense*, *S. curtilobum*, *S. chaucha* and *S. ajanhuiri*, and others such as *S. chocclo*. Some of the forms of *S. andigenum* are distinguished by high starch and protein contents, resistance to most races of *Phytophthora* and resistance to virus V and leaf roll. Reference is made also to recently selected forms belonging to this species which have shown resistance to nematode and transmitted this character to their sexual progeny. Mention is made of successful experiments, especially in Latvia and White Russia, on transmission of wart resistance by grafting.

1436 Zakopal, J. & Spitzová, B.
Zlepšená metoda laboratorního zkoušení kříženců bramborů na vzdornost proti rakovině bramborů. (**An improved method of testing potato hybrids for wart resistance**).
Věd. Práce výzk. Ústav. rostlin. Výrob. 1955 : 171–76.

A modification of the Glynn-Lemmerzah

method designed for testing hybrids under laboratory conditions is described. It is cheaper, quicker and more reliable than the earlier one and is suitable for studying biotypes of the causal organism and for experiments on the use of growth substances.

1437 McKay, R. & Loughnane, J. B.
Effects of single strains of virus X, of virus A, and of crinkle (X + A) on three potato varieties: and observations on the progeny of these plants in 1953.
J. Dep. Agric. Éire 1953–54 : **50** : 94–103.
This is a shortened version of the article summarized in *PBA*, Vol. XXIII, Abst. 2054.

1438 Mastenbroek, C.
Veredeling van de aardappel op resistentie tegen het X-virus. (**Breeding potatoes for resistance to virus X**).
Meded. Nat. Coöp. Aan- Verkoopver. Landb. Cent. Bur. 1953 : **37** : 94, 98.
The economic importance of breeding for resistance to virus X is stressed and methods by which this goal may be attained are outlined. The author believes that breeding for hypersensitivity offers practical advantages over breeding for immunity. The English varieties Epicure and Craigs Defiance, both of which are hypersensitive to all English and most Continental strains of virus X, are recommended as being suitable for crossing with Netherlands varieties. Hypersensitivity in these two varieties is a simple dominant character. The American experimental line USDA41956, in which resistance is determined by two dominant genes, may prove of value in breeding for immunity. It is also possible to transfer wild genes from *Solanum acaule* to cultivated varieties, but this method entails a prolonged breeding programme.

1439 Webb, R. E. & Buck, R. W. (Jun.)
A diagnostic host for potato virus A.
Amer. Potato J. 1955 : **32** : 248–52.
Solanum demissum PI175404 has proved to be valuable as a diagnostic host for virus A and is being used extensively for the detection of this virus in seedling testing at Beltsville, Md.

1440 Singh, H. B. & Bhagchandani, P. M.
The two new Pusa sweet potatoes that excel.
Indian Fmg. 1955 : **5** : No. 6 : 26–32.
Pusa Suffaid, a selection from Chinese material, and Pusa Sunehri [(Porto Blanco x Wannop) x Australian Canner] have outyielded over a hundred other varieties at the Indian Agricultural Research Institute, New Delhi. The former is white-fleshed and of good eating and storage quality. The latter is a slightly lower-yielding yellow-fleshed variety, also of good eating quality.

1441 Nettles, V. F.
Sweet potato variety trials in Florida.
Circ. Fla. agric. Exp. Sta. 1954 : No. S–71 : Pp. 8.
The main results of trials carried out on varieties and unnamed selections during 1951–52 are summarized. Unit No. 1 Porto Rico gave a satisfactory performance in all trials of late plantings made with cuttings. Goldrush, which equalled Unit No. 1 Porto Rico in yield except in 1952, is worthy of note on account of its deep orange flesh and wilt resistance. The orange-fleshed variety Earlyport merits further trial in early plantings.

1442 Kehr, A. E. & Yu Chen Ting
Cytological evidence concerning the evolution of *Ipomoea batatas*.
J. Tenn. Acad. Sci. 1953 : **28** : p. 182. (Abst.).
A study of meiosis in *I. batatas* is reported. No multivalents were observed but secondary associations involving 4–5 groups of 3 bivalents and 6–9 groups of 2 bivalents were noted. It is concluded that *I. batatas* arose in comparatively recent times as an amphidiploid of a $4x$ x $2x$ cross.

1443 Werner, O.
Studien zur vegetativen und generativen Vermehrung der Batate (*Ipomoea Batatas* LAM.) im Dienste ihrer Akklimatisation als Kulturpflanze in Österreich. [**Studies on the vegetative and sexual propagation of the sweet potato (*I. batatas* LAM.) as an aid to its acclimatization as a crop plant in Austria**].
Öst. bot. Z. 1955 : **102** : 395–419.
The results of further studies at the University of Vienna are reported (cf. *PBA*, Vol. XXV, Abstr. 3218). A number of introductions from the USA, South America, Java and Hawaii have been tested as to their suitability for cultivation in Austria.

FIBRES

1444 Baxa, F.
Pestovanie bavlny v ČSR. (**Cotton growing in Czechoslovakia**).
Pol'nohospodárstvo 1955 : **2** : No. 1 : 16–29.
The Research Institute for Acclimatization of Thermophilous Plants at Hurbanovo-Sesíeš has investigated the possibilities of acclimatizing

cotton in Czechoslovakia. The material investigated was an assortment of Soviet and Bulgarian varieties. The most promising varieties were Čirpan 2362 č.38, Malkov, Kamon breg, the Sadovo lines 1017, 3059, 2351 and 2361, and the Soviet varieties 13656 and 143–I.

1445 Mandy, G.
Üvegházban végzett gyapotfajta-vizsgálatok eredményei. (**The results of experiments on cotton varieties under greenhouse conditions**).
Magyar tud. Akad. Biol. Agrártud. Oszt. Közl. 1951 : **2** : 195–228.

Investigations on 21 varieties from Hungary, the USSR, Bulgaria and America grown under glass in Hungary are reported. Data are given on the morphology of the seedlings and adult plants and on vegetative period. It was noted that *purpurascens* characteristics were frequent in the Bulgarian and Soviet varieties.

Progress reports from experiment stations, season 1953-54.
Emp. Cott. Gr. Corp. Lond. 1955.

1446 *Hutchinson, J. B. Survey of progress reports for the season 1953–54.* (*pp. 3–7*).

Genetical and breeding investigations are among the activities briefly reviewed.

Cotton Research Station, Namulonge, Uganda.

1447 *Hutchinson, J. B. Review of the research programme.* (*pp. 1–8*).

A section outlining breeding policy is included. Emphasis is being laid on the study of technique. Using BP52, a cotton already highly bred and fairly uniform, the rate of advance under selection is being estimated. For synthesizing material from a group of useful parents, the value of setting up mixed stocks under conditions favouring natural crossing is being explored. Three such stocks have been developed; consideration is now being given to the types of selection to be applied.

1448 *Macdonald, D. & Manning, H. L. Progress report for the season 1953–54. Plant breeding.* (*pp. 28–35*).

Further progress was made in selecting Albar 51 and BP52 for resistance to the stem phase of bacterial blight combined with several other desirable characters. The F_1 of crosses of selections of Albar 51 with MU8 x BP52[2] strains showed considerable resistance to natural infection by blight. Isolation of strains within Albar 51 resistant to both blight and *Verticillium* wilt continued. Modal bulks 6MB and 7MB of BP52 have each given mean lint yields 5–6% better than the respective preceding generation, 5MB having surpassed the original bulk by 17%. The technique of modal-bulk production is explained in *PBA*, Vol. XXI, Abst. 2822. Bulks of selected progenies of BP52 have also shown a marked cumulative advance in yield. A multiline stock of BP52, designated NC54, is to undergo multiplication.

1449 *Peat, J. E., Munro, J. M. & Arnold, M. H. Tanganyika Territory. Lake Province. Progress report for the season 1953–54.* (*pp. 1–24*).

Progress has been made in selecting for bacterial-wilt resistance in back crosses of Ukiriguru strains x Albar 51. Incorporation of B_{6m} into Ukiriguru strains has been initiated. Uk53, the latest addition to the Uk series of composite seed-issues, has not shown superiority in yield or spinning qualities over Uk48 and Uk51; its multiplication may therefore be discontinued. Uk48 and Uk51 again surpassed Mz561 in yield (cf. *PBA*, Vol. XXV, Abst. 1225).

1450. *Smith, R. Tanganyika Territory. Eastern Province. Progress report for the season 1954. Plant breeding.* (*pp. 2–6*).

Of better quality but with lower ginning outturn, the rain-grown type 47/10 is replacing Local. Selection is in progress to improve its ginning outturn. In view of the irrigation scheme planned for the Rufiji valley, Egyptian types from the Sudan are to be compared with local long-staple Upland cottons at Lupiro; in addition, selections for longer lint from the rain-grown crop may be tested.

1451 *Hastie, M. S. Kenya. Nyanza Province. Progress report for the season 1953–54.* (*pp. 1–6*).

Some Ukiriguru strains yielded well in trials.

Anglo-Egyptian Sudan. Progress report of the cotton breeding stations, seasons 1953–54.

1452 *Rose, M. F., Hughes, L. C. & Low, A. Gezira Station.* (*pp. 2–12*).

In work on the L group of Egyptian cottons derived from X1730, bulks of BAR4/16 and BAR5/6 at the testing-plot stage of the new procedure of selection adopted gave disappointing yields compared with the commercial variety X1730A (cf. *PBA*, Vol. XXV, Abst. 400). Substrains of BAR4/16 and BAR5/6 not significantly lower yielding than X1730A were bulked for sowing in the first "panmixis plot" at Shambat. Transference of lint retention from *G. contextum* to BLR14/25 and the building up of salt tolerance in the latter type continued. In variety trials, the L group of types was

superior to the S group consisting of Sakel cottons. Of the *G. hirsutum* varieties tested under irrigated conditions, only Punjab 268F, Hopi Acala, and BAR11/7 emerged as worthy of further consideration. *G. hirsutum* cottons show less salt tolerance than Egyptian.

1453 *Knight, R. L., Dark, S. O. S. & Saunders, J. H. Shambat station.* (*pp. 12–17*).

Further progress was made in increasing the leaf-curl resistance of BLR14/25.3 [third filter of Sakel type BLR14/25 (B_2B_3)] and in transferring B_{6m}, an intensifier of blackarm resistance originating in *G. arboreum*, to Sakel and X1730 types homozygous for B_2 or B_2 and B_3. A recessive gene (b_8) for blackarm resistance in *G. anomalum* is linked with R_2 with a cross-over value of 1·4%. In two separate autoallotetraploid transferences of B_4 to Sakel, this gene was transmitted to the same locus in the AD genome.

In American-Upland breeding, transference of B_{6m} from synthesized Sakel strains to various types, mostly B_2 or B_2B_3, continued.

In breeding for jassid resistance, advanced back-cross lines of blackarm-resistant Sakel with a high degree of hairiness derived from MU8b have been secured. By transferring the Ferguson minor-gene complex for hairiness (cf. *PBA*, Vol. XXV, Abst. 1227), BLJR14/36, with adequate hairiness for jassid resistance, has been developed; it also possesses some resistance to leaf curl. Further back crosses are to be made to improve its lint quality and render it homozygous for B_3 in addition to B_2. The gene for hairiness transferred from 4*n* *G. arboreum* 'Multani' to Sakel was identified as H_1. The association of H_2 with reduction in staple length in *G. tomentosum* crosses is due to linkage and not pleiotropy. Lines of blackarm-resistant H_2 Sakel with good staple length are however available and may prove valuable for improving the lint length of shorter stapled types.

BLJR14/29 (Sakel $H_1 + B_2B_3$), a noncommercial variety moderately resistant to leaf curl, is being used as a recurrent parent in breeding for hairiness. Although lower yielding than BLR14/25, it has been necessary to use this variety as a recurrent parent for a limited number of generations to dissociate the minor-gene complex of Ferguson from H_1^K, which is completely linked with a factor for chlorophyll deficiency, and to bring this complex into association with H_1.

Transference of increased locule number from Ferguson and several other types and of higher number of ovules per locule from *G. auritum* to BLR14/25 is proceeding. The second character appears to be polygenic.

Using BLJR14/29 as recurrent parent, transference of high lint strength from *G. thurberi* continued. Many of the plants obtained by back-crossing pentaploids from *G. "anomadense"* x BLR14/25.1 possessed the leaf hairiness and toughness of the wild species.

In breeding for resistance to pink and Egyptian bollworm, promising selections were obtained from [(*G. "thurbadense"* x Sakel) x XA129²] x BAR11/7 for further back crossing to BAR11/7. BAR11/7 is a derivative of XA129 (a selection of Pump Scheme Strain) carrying B_2 and B_3.

In transferences involving *G. armourianum* via *G. armadense*, considerable sterility was still encountered but some plants apparently bollworm-resistant were selected for further back-crossing to BLR14/25.

Transference of earliness from *G. arboreum* and *G. herbaceum* to BLR14/25 is under way.

1454 *Rose, M. F. & Low, A. Kadugli station.* (*pp. 17–20*).

For the second season in succession, the Upland type BAR7/8.1 (BAR SP84 carrying B_2 and B_3) maintained its high yield in trials in Kordofan; it also showed adaptability to the central rainlands and Equatoria.

1455 *Ducker, H. C. Nyasaland. Cotton Experiment Station, Chitala. Progress report for the season 1953–54.* (*pp. 1–9*).

Trials were concerned solely with locally bred strains; CL20 again proved high yielding. Albar 51 stocks and crosses involving Albar 49 showed promise with respect to resistance to bacterial blight.

1456 *Gillham, F. E. M. Southern Rhodesia. Cotton Research Station, Gatooma. Progress report for the season 1953–54.* (*pp. 1–9*).

Back crosses involving Albar 49 or Albar 51 as the donor of resistance to bacterial blight and A5851 and A618 as the recurrent parents are being selected. The commercial strain 9L34 is being sieved with respect to its main useful characters. Selections of Albar 51 with good lint quality and high ginning outturn have been obtained.

1457 *King, H. E. Northern Nigeria. Progress report for the season 1953–54.* (*pp. 1–21*).

Reselection and testing of material derived from Samaru 26C and its relatives continued.

1458 *Anson, R. R. Aden Protectorate. Abyan Cotton Experiment Station. Progress report for the season 1953–54.* (*pp. 1–5*).

The production of nucleus seed stocks of pure Abyan selections continued. Under Abyan

conditions Wilds Early has displayed some resistance to *Fusarium* and *Rhizoctonia* wilt. The F_1 of Wilds Early x 1730A produced long pointed bolls with finer and longer lint than that of either parent; using this material the development of a wilt-resistant type of 1730 is to be attempted.

1459 *Lochrie, J. V., Spence, J. R. & Cave, C. T. West Indies. Cotton Experiment Stations. Progress report for the season 1953–54.* (*pp. 1–19*).

Selection of V135 and MSI continued at the St. Vincent and Montserrat stations respectively. In Antigua, selection has been principally concerned with VH8. Preliminary investigations on a wide range of *G. barbadense* and *G. hirsutum* types continued at the Antigua station, with a view to the possibility of cotton growing in British Guiana and British Honduras.

1460 *Peters, R. W. Queensland. Regional Experiment Station, Biloela. Progress report for the season 1953–54.* (*pp. 1–16*).

Selection of jassid-resistant back-cross strains of Miller continued. Selection of Ca122, an American Upland variety with stormproof properties which render it suitable for mechanical harvesting, was undertaken.

1461 **(I. V. Mičurin and his ideas in respect of cotton production).** Hlopkovodstvo (Cott.-raising) 1955 : No. 10 : 3–9. [Russian].

Mention is made of new Soviet varieties distinguished by high yield, earliness, disease resistance, large bolls and improved quality of fibre. They have been obtained by intervarietal and interspecific crossing, vegetative hybridization, directed training and the use of vegetative rapprochement and other Mičurinist techniques.

1462 **Thirty-third Annual Report of the Indian Central Cotton Committee for the year ended 31st August, 1954** : Pp. 117.

Genetics

A new major gene, li_1, for the lintless condition in Asiatic cottons was identified in Banilla lintless and Khargone lintless. The gene determining the short-linted mutant described by Balasubramanian is homologous with li_d.

Various combinations of green and white fuzz and lint in Upland cotton are determined by multiple alleles. Further data were collected for elucidating the linkage relationships of genes for lint production, chlorophyll deficiency and anthocyanin distribution in Asiatic types.

Among derivatives of hybrids between cultivated American strains and *Gossypium thurberi*, progeny TH144 was outstanding with respect to ginning percentage, halo length and jassid resistance. Back crosses of interspecific hybrids from Surat with Indore 2 have yielded extremely hairy, jassid-resistant types with good fibre properties.

In work on the development of a desi strain for Malwa, a trial of F_2 derivatives of crosses of Malvi 9 with M5–A, Pratap and H420 revealed a number of valuable progenies. As a possible variety for irrigated conditions in Malwa, B49–143, a selection of Indore–4, again showed promise, surpassing Indore–2 in yield and ginning outturn.

Bombay

In tests of strains for the Khandesh tract, 29–7–4 maintained its superiority in yield over Virnar (197–3) for the fourth year in succession.

Development of a strain with an even higher degree of wilt resistance than 2087 is being attempted in work on cotton for the Surat area (cf. *PBA*, Vol. XXV, Abst. 2197).

The high-yielding strain 98–41 is to be released as a substitute for Vijay in the Broach tract.

A substation has been established at Kadiadra in the Sabarkantha district to develop early, frost-resistant types for the northern part of the tract.

In work on the improvement of Wagad, selection 280–1 (Kalyan x H8–1) has again shown improvement over Kalyan in early maturation and yielding capacity.

In trials of strains of Mathio, CJ–73 (C520 x Jarila) was superior in yield and lint quality to Pratap.

Search for a more satisfactory type than Laxmi for the Dharwar-American tract continued (cf. *PBA*, Vol. XXV, Abst. 2197). Cultivation of pure strains or F_1 hybrids of perennial cotton on grass and waste lands in the tract may prove valuable; both intraspecific and interspecific hybrids are being studied. A scheme for breeding American cotton resistant to black arm was initiated at Dharwar.

So far three superior strains, 170–C2, 68 x 22 and 134–Co.2–M, possessing a staple length of over 1 in., have been isolated from interspecific crosses at Surat.

Punjab

In work on cotton for the south-eastern districts, reselection of 2168/H14 has resulted in further improvement (cf. *PBA*, Vol. XXV, Abst. 2197). LL29, a long-stapled American strain developed

by hybridization between local and introduced types, maintained its good performance.
American strains outyielding 320F have been selected in the scheme for the central and submontane districts.

Madras
F_1 hybrids of Co.2 x Montserrat gave high yields and may prove valuable for use as a winter crop on the west coast, provided an economic method of seed production can be found. MU2 is to replace MU1 for summer cultivation in the coastal districts of South Arcot.
In their second year of testing, 6186 and 6874, strains developed in the scheme on Tinnevelly and Karungani cotton, again showed promise; they have high ginning outturn and wide adaptability (cf. *PBA*, Vol. XXV, Abst. 389).

Andhra
The scheme sanctioned by the Government of India for improving Cocanadas cotton, while retaining the light pinkish tint of its lint, has now been terminated; it resulted in Cocanadas–1 and Cocanadas–2. Further breeding on coloured cotton has now been taken over by Andhra State. Work on the production of a white-linted type for the tract has been initiated under the auspices of the Government of India.
Progress is reported in developing strains superior to 851F for the Mungari tract.
In work on White Northerns cotton, strains 5975 and 5001 were superior to N14 in yield, ginning percentage and halo length on cultivators' holdings.

Madhya Pradesh
In the first year of the programme for breeding desi cotton, single-plant selection was effected at four centres. The aims of the recently initiated scheme for developing improved American types include the production of disease and jassid resistant varieties.

Uttar Pradesh
Longer-stapled strains of desi and American cotton are being developed for the western and central regions; promising hybrid selections have been secured. The possibility of exploiting hybrid vigour in crosses between *G. hirsutum* and *G. barbadense* to obtain extra-long staple is being explored.

Assam
Work on the production of high-yielding types with coarse, short staple and high ginning outturn continued; the survey and collection of cottons cultivated in the state were completed.

Hyderabad
Recommended for distribution in the Parbhani district, II–45–2204 surpasses its parent variety, Gaorani 12, by 4–5% in ginning performance. It is to be further improved in fibre length, wilt resistance, bolling and ginning outturn.

Pepsu
In tests of American types, 320F proved superior to the local cotton in yield and resistance to pest attack.

Mysore
In breeding long-staple American cotton, selections of MAS x Tidewater and MAS x Express showed promise. Progress was also made in the schemes for improving Cambodia cotton in the Bellary district and the Westerns type.

Rajasthan
Of the American types developed for Mewar, M49–398 gave the best spinning performance, with 48's HSWC.

Madhya Bharat
As described above under *Genetics*, breeding for the Malwa area continued at the Institute of Plant Industry, Indore.
D46–5 and D48–154 are to be released for the Nimar tract (cf. *PBA*, Vol. XXV, Absts. 388 and 2197).

1463 Bryan, W. E.
Prospects for Pima S-1 cotton.
Progr. Agric. Ariz. 1955 : **7** : No. 2 : p. 6.
Further details are given of yield and spinning tests of Pima S–1 (cf. *PBA*, Vol. XXIV, Abst. 478), a selection from a number of crosses involving Pima, Stoneville 4, Sea Island and the Peruvian variety Tangüis.

1464 Pressley, E. H.
Reporting on new strains of cotton tested in 1954.
Progr. Agric. Ariz. 1955 : **7** : No. 2 : p. 9.
Details are given of the yield, lint percentage and spinning quality of 15 strains tested at the University of Arizona. Most of the strains originated from the cross (Acala x Durango) x [44 x (Acala x Durango)].

1465 Méndez R., E. D.
Creación de variedades de algodón. Campaña 1953–54. (**Creation of cotton varieties. Season 1953-54**).
Inf. mens. Estac. exp. agríc. La Molina 1955 : **29** : No. 331 : 4–7. (Mimeographed).
Selection 676–51 from Tangüis x Pima surpassed

several of the Tangüis selections in lint yield but was not superior to line LMW12–40 and the Tangüis selections were all higher in tensile strength.

1466 Méndez R., E. D.
Mejoramiento del algodón Tangüis. Campaña 1953–54. (**Improvement of Tangüis cotton. Season 1953-54**).
Inf. mens. Estac. exp. agríc. La Molina 1955 : **29** : No. 332 : 10–18. (Mimeographed).

Selections LMW1877–50 and LM1041–49 were outstanding in yield of lint; the former is resistant to wilt (*Verticillium albo-atrum*) and both give lint of high tensile strength (57·614 and 72·312 lb. per sq. inch respectively). Line LM–WI–52 has also given good yields in various localities affected by wilt, and elsewhere the early-maturing selection LM1041–49 has done well, both these lines having produced lint of good quality.
Selection is also being carried out for resistance to *Thielaviopsis basicola*.

1467 Kadymov, M., Valiev, M. & Zakarjan, M.
(**Suitability of new cotton varieties for mechanized harvesting**).
Hlopkovodstvo (Cott.-raising) 1955 : No. 10 : 29–31. [Russian].

Among the new promising varieties bred at the Azerbaïdžan Cotton Institute, 2421, 2018/2, 2459, 2624 and 2655 have a habit suitable for combine harvesting.

1468 Arutjunova, L.
(**Using vegetative hybridization in cotton breeding**).
Hlopkovodstvo (Cott.-raising) 1955 : No. 10 : 10–15. [Russian].

Instances of heritable effects of stock upon scion are reported from the Central Breeding Station of the USSR Cotton Institute. For instance, the scion of the intervarietal graft hybrid S3210/S460 gave a seed progeny improved with respect to boll size, fibre length and ginning percentage. New forms possessing good economic characteristics have also been obtained by interspecific vegetative hybridization, notably by grafting *Gossypium hirsutum* on *G. barbadense*. The use of a mentor to strengthen the inheritance of one or other component of a sexual hybrid is mentioned. In the cross 8196 ♀ x 108F ♂ the seed parent predominated if it had been grafted before crossing on S460; the pollen parent predominated if the mother plant had been grafted on 2850.

1469 Pudovkina, Z. M. & Tribunskiĭ, A. N.
(**Directed changing in respect of earliness in cotton plants**).
Agrobiologija (Agrobiology) 1955 : No. 5 : 113–24. [Russian].

At the USSR Cotton Institute the F_1 of S460 x S3404 and of S3316 x S460 acquired greater earliness when subjected to short days. The changes were heritable. Long days retarded maturation of the F_1 of S3404 x 108F. The effects of long day were also heritable.

1470 Dark, S. O. S.
Hormone treatment to prevent shedding of breeding cotton bolls.
Emp. Cott. Gr. Rev. 1955 : **32** : 277–80.

At Shambat and Wad Medani, Sudan, flower shedding in cotton crosses could generally be prevented by painting the calyx and inner surface of the bracteoles at the time of pollination with a 1000 ppm. aqueous solution of the sodium salt of α (2,4,5-trichlorophenoxy) propionic acid together with a wetting agent. In some cases higher concentrations of 2000 ppm. or more applied at weekly or fortnightly intervals until maturity was reached were more effective.

1471 Rumi, V. & Vlasova, N.
(**Growth of pollen tubes in the style and ovary of intervarietal hybrids**).
Hlopkovodstvo (Cott.-raising) 1955 : No. 10 : 16–19. [Russian].

In Uzbekistan, the growth rate of pollen tubes and the number of fertilized ovules in some F_2 and F_3 hybrids of cotton, obtained by multiparental pollination, have been studied. It was concluded that these characters depended both on the ♀ parent and on the varieties that supplied the pollen. It is therefore suggested that counts of pollen tubes penetrating the style and number of fertilized ovules should form the basis for testing the suitability of the pollen mixture for a variety.

1472 Simpson, D. M., Landstreet, C. B. & Duncan, E. N.
Effect of fiber irregularity on spinning performance.
Agron. J. 1955 : **47** : 425–29.

Data are presented indicating that mixtures of lint from varieties with widely different fibre properties give a yarn strength approximating to the arithmetic mean of the component varieties but differ little in spinning characteristics from lint from single varieties. It is concluded that the lack of uniformity of lint likely to result from hybridization and the

production of synthetics will also have little effect on spinning quality.

1473 NANJUNDAYYA, C.
Technological reports on standard Indian cottons, 1954.
Technol. Bull. Indian Cott. Comm. 1955 : Ser. A : No. 86 : Pp. 90.

A report is given of fibre and spinning tests carried out on the 17 varieties used in 1954 to set up standards for the evaluation of newly developed cottons (cf. *PBA*, Vol. XXIV, Abst. 3161).

1474 NANJUNDAYYA, C.
Technological reports on trade varieties of Indian cottons, 1953.
Technol. Bull. Indian Cott. Comm. 1953 : No. 84 : Pp. 79.

NANJUNDAYYA, C.
Technological reports on trade varieties of Indian cottons, 1954.
Technol. Bull. Indian Cott. Comm. 1954 : No. 87 : Pp. 80.

Data are given on the ginning percentage and spinning performance of samples of 30 and of 31 varieties from the 1952–53 and 1953–54 crops respectively (cf. *PBA*, Vol. XXIV, Abst. 462).

1475 KAZIEV, T.
(The role of bees in pollination of the cotton plant).
Hlopkovodstvo (Cott.-raising) 1955 : No. 12 : 39–40. [Russian].

At Kirovabad, Tadžikistan, the length and strength of fibre of all varieties were improved when bees were made available for pollination. The bees increased the percentage of fertilization, average number of bolls per plant, yield and boll weight.

1476 AHMAD, N.
The Institute of Cotton Research and Technology.
Pakist. Cott. Bull. 1955 : **3** : No. 10 : 1–20.

An account is given of the above institute, which has recently been established at Karachi with the purpose of carrying out fundamental technological research and fibre and spinning tests on standard varieties and on the improved strains evolved by breeders in Pakistan.

1477 KERR, T.
Measuring cotton fiber strength at finite gauge lengths in the breeding program.
Tex. Res. J. 1954 : **24** : 507–10.

It is recommended that the fibre strength of cotton varieties should be measured with a distance of $\frac{1}{8}$" between the holding jaws of the tester instead of at the zero distance of the normal Pressley tester. Fibre strength at the $\frac{1}{8}$" gauge is far better correlated with yarn strength. It appears that when selection for fibre strength is based on the results of the Pressley tester, the tendency is to select for a low X-ray angle of the cellulose helix.

1478 LJAO LU-JANJ [LIAO LU-YAN]
(Achievements and prospects of progress in cotton production in new China).
Hlopkovodstvo (Cott.-raising) 1955 : No. 10 : 51–56. [Russian].

Reference is made to Chinese trials of the varieties S3173, 108F and OD1 which have been introduced from the USSR.

1479 KOKUEV, V.
(How we utilize Mičurinist methods in cotton breeding).
Hlopkovodstvo (Cott.-raising) 1955 : No. 11 : 43–49. [Russian].

Descriptions are given of a number of new varieties from Taškent, most of them distinguished by large boll, early maturation, good length and quality of fibre, and high yield of raw cotton, notably the amount produced before the onset of frosts. S 3381 (S 3173 x 8802) and S 5463 (S 3381 x mixed pollen) show resistance to wilt and gummosis and S 3433 (611b x mixed pollen) resistance to wilt. New varieties still under trial include S 5465, S 5418, S 5500 and S 5501 (all from S 5502 x S 460), which all surpass the standard 108F in yield and earliness. The fibre quality, especially of S 5500, is good. Other material, with valuable economic properties said to be heritable, has been obtained by grafting existing varieties on to stocks of others. For instance, the new variety S 3518 (S 3210 grafted on S 460) is characterized by large boll, good fibre quality, high ginning percentage and greater productiveness and earliness than the standard 108F. The new varieties S 5457 and S 5456, obtained by grafting S 5412 on S 3173 and S 3210 respectively, possess the good characteristics of S 5412 without its principal shortcoming, late maturation. S 3446 and S 3478 show certain improvements over S 3210 and S 3173 from which they have been developed by grafting on another variety. Similar improvements in S 3173 were also obtained by working it with a scion of *Gossypium brasiliense*. Mention is made of experiments on the wild species *G. harknessii* which does not normally produce fruits at Taškent. By grafting upon an F_1 hybrid of *G. hirsutum* x *G. barbadense* it

was induced to fruit, but the ability to reproduce was not transmitted to the seed progenies till the fifth year of bearing.

1480 Kalyanasundaram, R.
Soil conditions and root diseases. XIV. Host-parasite response to *Fusarium* wilt.
Proc. Indian Acad. Sci. 1955 : Sect. B. **42** : 145–53.

Using the resistant varieties Cambodia 2 and Madras Uganda (*Gossypium hirsutum*) and susceptible varieties Karunganni 2 and Malvi 9 (*G. arboreum*), evidence was obtained that resistance to *F. vasinfectum* depends upon a higher reserve of carbohydrates and ascorbic acid; these substances are probably involved in the production of a toxin inhibiting the spread of the pathogen in the vascular system.

1481 Korosteleva, V.
(Research on seed production and breeding in Tadžikistan).
Hlopkovodstvo (Cott.-raising) 1955 : No. 11 : 60–61. [Russian].

Trials of new cotton varieties distinguished by long fibre and other good fibre properties are referred to briefly. In the Vahš valley, the variety 504V has superseded 2IZ, since it is better adapted to the local climatic and soil conditions and shows resistance to *Fusarium* and other diseases.

1482 Staffeldt, E. E. & Fryxell, P. A.
A measurement of disease reaction of cotton to *Verticillium* wilt.
Plant Dis. Reptr. 1955 : **39** : 690–92.

Details are given of a method used for grading individual plants for *Verticillium*-wilt resistance in selection at the New Mexico Agricultural Experiment Station. The grading is based on the percentage functional photosynthetic area and on external symptoms.

1483 Wijffels, A.
Welk vlasras in 1956? **(Which flax variety in 1956 ?)**
Friesch LandbBl. 1955 : **52** : p. 93.

The comparative merits of Concurrent, Solido, Wiera and other varieties are discussed. It is concluded on the basis of recent trials that Solido and Wiera are the most suitable varieties for cultivation in the Netherlands.

1485 Hoffmann, W. & Zoschke, U.
Röntgenmutationen beim Flachs (*Linum usitatissimum* L.). **[X-ray mutations of flax (*L. usitatissimum* L.)].**
Züchter 1955 : **25** : 199–206.

Seeds of the flax varieties Eckendorfer früh [Eckendorf Early] and Mährisch-Schönberger Stamm 6 [Moravian Schönberg strain 6], the linseed Sorauer Stamm 65 [Sorau strain 65] and the dual-purpose flax Mährisch-Schönberger Stamm 36 were X-irradiated at the Hohenthurm Plant Breeding Institute, East Germany, to obtain information on the possible economic value of induced mutations in *L. usitatissimum*. This species was found to mutate readily under the influence of X rays and, in all, 523 mutants were obtained. Mutations in the colour of the flower and anthers were frequent in all four varieties. In the case of Mährisch-Schönberger Stamm 6 a large number of small-flowered mutants were observed. Several long-strawed mutants were obtained from Mährisch-Schönberger Stamm 36. Among the mutants were several of economic value, including flax plants with larger seeds, linseed with longer straw and flax with increased fibre content and thickness of fibres.

1486 Dirks, V. A., Ross, J. G. & Harpstead, D. D.
Colchicine-induced true breeding chimeral sectors in flax.
Genetics 1955 : **40** : 569–70. (Abst.)

On treating epicotyls of F_1 seedlings of Crystal x B 5128 with 0·5% colchicine in lanolin, one plant was secured which produced true-breeding $2n$ branches with brown seeds, like those of B5128, or yellow seeds, like those of the other parent. It is suggested that the origin of these sectors may be attributed to the induction of reductional grouping of the chromosomes, followed by restoration of the $2n$ number.

1487 Sizov, I. A.
(Evolution of cultivated flax).
Problemy Botaniki (Problems of Botany). Akademija Nauk SSSR : 1955 : **2** : 113–66. [Russian].

A study of over 4000 forms in the world collection at Leningrad has shown that in spite of the wide range of variation both in morphological features and in physiological characters such as length of the vernalization phase, all the forms belong to the one species *Linum usitatissimum*. They are classified into a number of main groups, the first group consisting of the best fibre flaxes, including the mixed local populations of the northern USSR, with tall unbranched stems and high fibre content; they have arisen through conscious and unconscious selection for these qualities in areas with a favourable climate, where natural selection acts in the same direction. The Pskov flax is the typical representative of this group; it has

furnished the initial material from which most of the best improved varieties have been selected. The second group comprises fibre varieties, also from northern states of the USSR and from northern European countries; they are not of sufficiently high quality to qualify them for group I, are 10–15% shorter and adapted to areas with a more continental climate. Two groups of intermediate flaxes are established, one approximating more closely to the fibre flaxes of group II, the other to the linseeds. In normal sowings the first intermediate group is single-stemmed but two stems may develop under wide spacing; the seeds are larger and are used for oil, though the fibre can also be used for rough materials; some of the forms are drought resistant and grow in the Ukraine and adjacent areas. The dual-purpose flaxes of central Europe and of Canada and the USA belong to this group. The second intermediate group is found in the states of the USSR with a pronounced continental climate; the 1000 seed weight may be up to 8·5 g. and the oil content up to 44%; at wide spacings 1–2 supplementary stems develop. These forms are used mainly for seed but the fibre is also suitable for rough use; this group contains some of the most drought-resistant flaxes in the world and several drought-resistant varieties have been selected from it. The next group comprises the linseeds; some of the local populations of the Central Asian republics of the USSR display resistance to drought or to frost and many improved varieties have been produced by selection from them. Another group comprises the large-seeded linseeds of the Mediterranean basin, many of which are also possessed of resistance to drought, *Fusarium* or rust; several new varieties have been produced by crossing these forms with Russian types and one of them, Krupnosemjannyĭ 3 [Large-seeded 3] has been released; it combines drought resistance with high seed yield. Several promising dual-purpose forms with large seeds are among the hybrids. All this group is distinguished by very rapid development in the early growth phases. The last group is represented by the semiwinter forms of the Black Sea and Caspian shores, all characterized by many stems and by a longer vernalization phase and greater cold requirements than any other group; many of them are resistant to rust though not to *Fusarium*.

A general outline is given of the phases of growth and development in the flax plant and data are presented showing the influence of spacing on fibre yield and quality and on yield, size and oil content of the seed.

The views of various authors concerning the origin of cultivated flax are examined. Since all forms, even those that are found in southern countries, behave as long-day plants it is concluded that they are all ultimately derived from forms that arose in northerly latitudes. No amount of environmental influence will change the long-day reaction of the species; on the other hand other characters, such as branching, are readily modified, plants grown in long days being tall and unbranched whereas the same variety grown in short days becomes branched and shorter. Thus it is concluded that the original flax which arose in the Baltic area was a tall unbranched type and that as it extended into more southerly areas it became progressively shorter and more branched, the shortest forms being those of Ethiopia, Kenya and India. At the same time the fibre content and quality diminished and the seed size and oil content tended to rise. The contribution that the Pskov and other flaxes of northern Russia have made as a source of material for breeding improved flax varieties in many parts of the world in recent times is also emphasized. The linseeds seem to have arisen in Asia, including the southern republics of the Soviet Union, and Africa, the large-seeded group in Egypt and the semiwinter group in the vicinity of the Black Sea and the Caspian Sea.

1488 Masuo, Y. & Kikuchi, F.
(On the heritability of quantitative characters in flax).
Hokkaido Nogyo Shikenjo Iho/Res. Bull. Hokkaido agric. Exp. Sta. 1955 : No. 68 : 25–30. [Japanese].

The heritabilities of plant height, stem length, stem diameter and flowering period were calculated for the crosses Winter x Saginaw 1 and Original Finland x Pernau 1; the mean heritabilities were 0·61, 0·65, 0·40 and 0·50 respectively.

1489 Rajháthy, T. & Farkas, G.
Lenfajták fenológiai- és terméselemzése aszályos és kedvezö vízellátású viszonyok között. **(Phenology and crop analysis of flax varieties under conditions of drought and favourable water supply).**
Növénytermelés 1953 : **2** : 173–82.

From studies of their reactions to drought and irrigation, ten linseed and fibre varieties tested at the Martonvásár Research Institute, Hungary, are classified according to their adaptation to dry or irrigated conditions, yield of seeds per capsule, number of capsules per stem, 1000 seed

weight and plant height. On the basis of this classification a hybridization scheme for producing oil seed, fibre flax and dual purpose varieties with desirable combinations of characters is proposed.

1490 Sizov, I. A.
(Mičurinist science and flax breeding).
Agrobiologija (Agrobiology) 1955 : No. 4 : 72–78. [Russian].

Mention is made of new productive, tall, lodging-resistant varieties, obtained by distant hybridization at Smolensk, Pskov and Puškin. Crosses made at Puškin included Tekstiljščik [Textile Worker] x a large-seeded Egyptian form and Pobeditelj [Conqueror] x a semi-winter type from Abhazia. The hybrids from the latter cross were distinguished by large seed and all hybrids were appreciably taller than Tekstiljščik and Pobeditelj and produced high-quality fibre. Heritable differences were observed between hybrids from Puškin and those grown for several generations in the Kubanj. The former were characterized by longer stems, higher fibre output and resistance to *Fusarium*.

1491 Crescini, F.
Selezione artificiale e rapporti sessuali nella canapa (*Cannabis sativa* L.).
[**Artificial selection and sexual relationships in hemp (*C. sativa* L.)**].
Caryologia 1955 : **7** : 415–19.

A population of the hemp Carmagnola, in which the proportion of male to female plants was 100 : 112, having been subjected to selection for various morphological features was found to have altered in respect of sex ratio. Thus the race Pinnatifilla had a ratio of 100 : 135.052, whereas in the race Mesosperma it was 100 : 101.250. The mean value for the four races examined was 100 : 114.698, which was thus close to that of the initial population.

1492 Datta, R. M.
Cyto-morphological studies of pollen tubes in the jute species.
Caryologia 1955 : **8** : 188–93.

Pollen-grain studies in *Corchorus olitorius* 'Chinsurah Green' and *C. capsularis* 'D154', undertaken as part of investigations on incompatibility at the Jute Agricultural Research Institute, Barrackpore, West Bengal, are described. The most interesting feature observed was the formation of two tubes by a single grain, one containing the tube nucleus and the other the generative nucleus.

1493 Summers, T. E. & Pate, J. B.
Influence of temperature on the susceptibility of kenaf to *Colletotrichum hibisci* Poll.
Plant Dis. Reptr. 1955 : **39** : 650–51.

In investigations at the Everglades Station, Fla., some lines of *Hibiscus cannabinus* were completely susceptible to race 2 of *C. hibisci* at 20°, 25° and 30° C. whereas other lines were totally susceptible at 20°, affected but not killed at 25° and highly resistant at 30° C.

1494 Pate, J. B. & Summers, T. E.
Reaction of kenaf introductions and selections to races of *Colletotrichum hibisci*.
Plant Dis. Reptr. 1955 : **39** : 776–78.

Varieties and breeding lines were tested for reaction to races 1 and 2. The race here designated 1 consisted of an inoculum of the highly similar races 1 and 3 (cf. *PBA*, Vol. XXV, Abst. 1260). Among the varieties, only El Salvador showed some resistance to both races. Some lines of this variety were highly resistant to both races in the summer but gave an intermediate reaction in the autumn, lower temperatures after inoculation apparently accounting for the greater susceptibility. An F_4 line of El Salvador x Java PI207894 and two S_1 lines of Egyptian PI209230 showed the highest degree of resistance after inoculation in the autumn.

1495 **Annual Report of the East African sisal industry for the year ended 31st December 1954** : Pp. 84.

Cross pollination was effected among *Agave angustifolia* x *A. amaniensis* hybrids at Amani and Mlingano. At Mlingano the majority of the selected hybrids from Amani have proved disappointing in large-scale trials, many poling prematurely.

1496 Singh, H. B. & Sikka, S. M.
Pusa recommends two new luffa gourds.
Indian Fmg. 1955 : **5** : No. 5 : 25–28.

Selected from indigenous sources, the two varieties recommended, Pusa Chikni (*Luffa cylindrica*) and Pusa Nasdar (*L. acutangula*), are early fruiting. The fruits should be picked for use as a vegetable when 5–6 inches long.

1497 Shinohara, S., Kawamura, M. & Sano, M.
(Studies on breeding varieties of *Luffa* resistant to *Fusarium* wilt. I. The production of polyploids and their characteristics).
Ikushugaku Zasshi/Jap. J. Breeding 1955 : **5** : 32–40. [Japanese].

Colchicine-induced tetraploids of the Japanese

varieties *L. cylindrica* 'Daruma' and 'Tsurukuki' [Crane's Neck], and the Taiwan varieties *L. cylindrica* 'Beikan' [Rice Tube] and *L. acutangula* 'Tokado' [Ten-sided] and of hybrids between them are described. The tetraploids tended to have thicker and shorter fruits, stouter fibres and lower fertility than the corresponding diploids. The *Fusarium* resistance of the tetraploids showed no consistent difference from that of the diploids; in some cases it was unaffected, in others either increased or lowered.

1498 HÅKANSSON, A.
Chromosome numbers and meiosis in certain *Salices*.
Hereditas, Lund 1955 : **41** : 454–82.

Cytological investigations were carried out on some natural *Salix* spp. and on interspecific hybrids produced by Heribert Nilsson. The latter group comprised 2*n* hybrids, the intersectional hybrid *S. viminalis* x *S. alba*, combinations involving *S. phylicifolia* ssp. *weigeliana*, *S. cinerea* hybrids, *S. laurina* and some derivatives, and highly complex hybrids involving 8 to 14 species. Simple and complex hybrids possessing even numbers of basic genomes of $x = 19$ chromosomes showed good pairing and otherwise regular meiosis. Gametes with doubled or trebled numbers of chromosomes functioned in several hybridizations, as in the production of 6*n* *S. polygena* from a cross between a 2*n* quadruple-hybrid form and a 4*n* quadruple-hybrid parent, the hexaploid from *S. polygena* x 3*n* (*S. silesiaca* x *S. aegyptiaca*) and 8*n* *S. superlaurina* from 5*n* *S. laurina* x 6*n* *S. phylicifolia* spp. *weigeliana*. Hybrids with an odd number of 19-chromosome sets had less regular meiosis, owing to the formation of univalents.

SUGAR AND STARCH PLANTS

1499 HUANG, J. C.
Singing the praises of N : Co.310.
S. Afr. Sug. J. 1955 : **39** : 715–19.

The reasons for the success of the South African sugar cane N : Co.310 in Taiwan are discussed (cf. *PBA*, Vol. XVI, Abst. 561).

1500 HARBANS SINGH, HARDIAL SINGH & MANMOHAN SINGH
Co.L.29 has better qualities to offer.
Indian Fmg. 1955 : **5** : No. 7 : p. 37.

Developed at Lyallpur, Punjab, from fluff received from Coimbatore, the sugar cane Co.L29 has given higher yields of cane than the standard Co.313 in both the initial and ratoon crops. In juice quality it compares favourably with Co.313, being more satisfactory for gur making. Since the percentage of top to millable shoot is higher than in some other varieties, Co.L29 is also valuable for cattle feeding. It is moderately resistant to frost, insects and red rot, and, like Co.313, is early ripening.

1501 **Experiment Station of the South African Sugar Association. Distribution of cane variety N : Co. 376 during 1955-56.**
S. Afr. Sug. J. 1955 : **39** : p. 665.

N : Co.376 (Co. 421 x Co. 312) is widely adapted, and equal or slightly superior to N : Co.310 in sucrose yield per acre (cf. *PBA*, Vol. XXIII, Abst. 1345). It stools freely, thus providing a good canopy, and does not lodge readily. A characteristic pale blotching of the leaves facilitates identification. The variety appears to be fairly resistant to mosaic and has so far remained free from smut and red rot.

1502 ABBOTT, E. V., HEBERT, L. P., SCHEXNAYDER, C. A. & TIPPETT, R. L.
Seedling work at the Houma station during 1954-1955.
Sug. Bull., N. Orleans 1955 : **33** : 319–20.

Numerical and other information is provided on (1) the seedlings grown at the Houma station, La., from seed produced at Canal Point, Fla., Grand Isle, La., and Honolulu, Hawaii, and (2) foreign varieties received as cuttings. Of the material from Canal Point, seedlings from crosses of CP48/103 as ♀ with canes having high vigour or good growth type are of particular interest. The new variety CP48/103 possesses the highest sucrose content of any commercial cane produced in Louisiana (cf. Absts. 541–2).

1503 MONJES, P. H.
Descripción botánica y comportamiento cultural de nuevas variedades de caña de azúcar. (**Botanical description of new varieties of sugar cane and their behaviour under cultivation**).
Rev. industr. agríc. Tucumán 1955 : **39** : 16–21.

Brief descriptions are given of a number of canes introduced from Canal Point, Brazil and Puerto Rico for testing in Argentina.

Sugar Bulletin of the Department of Agriculture, British Guiana 1955 : No. 23 : Pp. 75.

1504 *Birkett, L. S. & Cameron, C. Field experiments with sugar cane, XXIII. (pp. 1–52).*

A report of trials of Barbados and Demerara seedlings is included. The following canes are recommended for the various soil types: B41227, B37161, B4098, D37/45, B4362, B4373, B46378, B43413 and B45137.

1505 *Birkett, L. S. The variety and fertilizer position of the sugar industry, XX.* (*pp. 53–63*).
Information on varietal yields and distribution in 1954 is provided. B34104 had the highest acreage (31·0%), followed by B431227 with 30·5%.

1506 *Report on the sugar experiment stations for the year 1954.* (*pp. 65–70*).
Material introduced is listed. The variety trials carried out are reported fully elsewhere (cf. Abst. 1504).

1507 *Pires, J. A. Major diseases of sugar cane in British Guiana.* (*pp. 71–75*).
A table is included giving the ratings of a large number of Barbados, Demerara, breeding and other canes for reaction to leaf scald.

1508 Hebert, L. P. & Matherne, R. J.
Results of sugarcane variety tests in Louisiana during 1954.
Sug. Bull., N. Orleans 1955 : **33** : 321–32.
The results of tests of commercial and unreleased CP canes at several centres in Louisiana are summarized. CP44/101 continued to give a good performance, although susceptible to ratoon stunting and borer. The recently released variety N : Co.310 outyielded CP44/101 by 8% in sugar per acre and 1% in sugar per ton of cane, showed good growth habit from the point of view of weed control, cold resistance, adaptability to both light and heavy soils and good milling qualities; it is however unsatisfactory for early milling and tends to lodge (cf. *PBA*, Vol. XVI, Abst. 561). Of the unreleased varieties, CP48/103 and CP47/193 were particularly promising (cf. Absts. 541–2).

1509 Gouaux, C. B. & Stafford, T. J.
Outfield sugar cane variety trials.
Sug. Bull., N. Orleans 1955 : **33** : 345–54.
In trials harvested on commercial plantations in Louisiana during 1954, CP48/103 and CP47/193 gave the highest yields of sugar per acre (cf. Absts. 541–2).

1510 Escobar Orozco, O. M.
Autoincompatibilidad en la variedad de caña de azúcar Mayagüez 336. (**Self incompatibility in the sugar-cane variety Mayagüez 336**).
Acta agron. 1955 : **5** : 135–46.
The results of interpollination between several varieties showed MC129 to be capable of functioning as either seed or pollen parent and POJ2878 and EPC21.399 as seed parents. Mayagüez 336 functioned as pollen parent in crosses with suitable female varieties and with suitable pollinators it functioned as seed parent; it set no seed from selfing however and this is attributed to self incompatibility. It can therefore be used in crosses without emasculation.

1511 **A new sugarcane "blood bank".**
Sug. Bull., N. Orleans 1955 : **33** : 366–68.
A note is given on the world collection recently established under the auspices of the International Society of Sugar Cane Technologists at the Sugarcane Breeding Station, Coimbatore, India. The objectives of the project include compilation of a catalogue of genetic stocks.

1512 Mazlumov, A. L.
(**Mičurin's breeding principles applied to sugar beet**).
Agrobiologija (Agrobiology) 1955 : No. 4 : 47–51. [Russian].
Reference is made to varieties notable for good root and sugar yields, earliness, resistance to drought and bolting, high rate of growth in the early stages and a good response to wide spacing and fertilizers. They have been bred at Ramonj in recent years. Among the most recent selections, R06 and R023 are highly productive of both roots and sugar and are particularly adapted to cultivation in squares.

1513 Mazlumov, A. L.
(**Research on sugar beet breeding**).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) 1955 : Ser. biol. : No. 5 : 50–56. [Russian].
This account of Mičurinist breeding research on sugar beets at the Ramonj breeding station includes observations on the combined effects of selection and external conditions upon formation of such heritable characters as yield, high sugar content, drought resistance, short growth period, good response to increased amounts of moisture and nutrients, moderate soil and moisture requirements and suitability for mechanized cultivation and harvesting. Mention is made of varieties R06, R931 and R023, all notable for high yield, good sugar content, earliness, resistance to drought and bolting and high initial rate of growth. They all respond by improved yields to fertilizers and wide spacing and thus are suitable for square planting.

Proceedings of the eighth general meeting of the American Society of Sugar Beet Technologists held in Denver, Colorado on 2-5 February, 1954 : **8** : Pt. 1 : Pp. 389.

1514 *Weiss, M. G. Patterns of cooperation in sugar beet research.* (*pp. 7–14*).
Work in progress in the USA in connexion with

the development of disease-resistant monogerm F_1 hybrids, breeding for suitability with respect to mechanized harvesting and the exploitation of wild species of *Beta* in breeding for disease resistance are among the activities outlined.

1515 *Hills, F. J., Burtch, L. M., Holmberg, D. M. & Ulrich, A. Response of yield-type versus sugar-type sugar beet varieties to soil nitrogen levels and time of harvest.* (*pp. 64–70*).

Experiments were carried out in California to compare (1) the performance of the sugar-type varieties SL 824 (US 25/2) and SL 828 with that of the standards US 33 and US 22/3 at four levels of nitrogen and (2) the performance of SL 824 and US 22/3 at the four levels of N used in the first experiment and, in addition, at three dates of harvesting. In both tests, highly significant varietal differences were obtained. The sugar types consistently contained higher concentrations of sucrose but produced lower yields of roots and sugar per acre than the tonnage types. Significant variety x date of harvest and variety x N level interactions were obtained with respect to root yield and sugar production per acre.

1516 *Giddings, N. J. Relative curly-top resistance of sugar beet varieties in the seedling stage.* (*pp. 197–200*).

Although resistance to both infection and injury caused by curly-top virus increased with age in all the sugar-beet varieties tested by the author, the increase in resistance was generally more rapid in varieties listed as resistant. The author therefore criticizes the frequently held view that resistant beets are injured as much as susceptible varieties if attacked at an early stage. More virulent strains have arisen during the last few years. When tested at the cotyledon or two-leaf stage, seedlings of the varieties SL 92MI and SL 92, both selections of US 22/3, have displayed a high degree of resistance to the extremely virulent strain 11.

1517 *Fife, J. M. Chromatography as a method of attack on the problem of the chemical nature of resistance of sugar beets to curly top.* (*pp. 207–11*).

Resistant and susceptible varieties differed in the chromatographic patterns of the aminoacids obtained from their phloem exudates.

1518 *McFarlane, J. S., Bardin, R. & Snyder, W. C. An Alternaria leaf spot of the sugar beet.* (*pp. 241–46*).

A hitherto unreported disease caused by *A. brassicae* has attacked three unrelated inbred lines at Salinas, Calif. Although varieties at present cultivated commercially proved to be resistant in the field, the disease offers a potential danger in that genes for susceptibility exist in some sources of germ plasm in use in breeding.

1519 *Schneider, C. L. Methods of inoculating sugar beets with* Aphanomyces cochlioides *Drechs.* (*pp. 247–51*).

Methods of obtaining zoospore inoculum of *A. cochlioides* and of inoculating seedlings in the greenhouse and field are described. In general, greenhouse and field tests gave similar ratings of lines with respect to resistance.

1520 *Gaskill, J. O. A comparison of several methods of testing sugar beet strains and individual roots for resistance to storage pathogens.* (*pp. 264–70*).

The following two techniques were among those studied: (1) agar inoculum was placed on the freshly exposed surface of a transverse slice of the tap root; and (2) a sterile wooden tooth-pick was dipped in a spore suspension (1 : 1000 Dreft solution) and pushed approximately 1 inch into the root. In the case of *Botrytis cinerea* and *Phoma betae,* inoculation by these two methods, using samples of 16 roots per strain, was nearly as effective as use of samples of 320 naturally infected roots as a means of determining differences among strains. In general, however, the results of inoculation tests with *B. cinerea* agreed more closely with those obtained from the noninoculated samples than did the data from inoculations with *Ph. betae.* Strain 2, selected from the synthetic variety US 226 for storage rot resistance, was markedly superior to the parental variety in resistance to *B. cinerea* but showed no improvement with respect to resistance to *Ph. betae.*

Proceedings of the eighth general meeting of the American Society of Sugar Beet Technologists held in Denver, Colorado on 2-5 February 1954 : 8 : Pt. 2 : Pp. 459.

1521 *Savitsky, V. F. Inheritance of the number of flowers in flower clusters of* Beta vulgaris *L.* (*pp. 3–15*).

As a result of segregation studies in hybrids between monogerm and multigerm beets it is concluded that the number of flowers per flower cluster (germs per fruit) is probably controlled by a series of alleles, designated as follows: *mm*, occurring in the inbred SLC 101 and giving monogerm fruits; M^1M^1, found in SLC 100 and resulting in the production of fruits with few germs; $M^{Br}M^{Br}$, present in the inbred GW 4821 and giving double-germ fruits; *MM*, a gene pair or number of related genes occurring frequently

among multigerm varieties and giving an average of about three flowers per cluster; and M^zM^z, isolated from Kleinwanzleben ZZ and governing the production of a large number of germs per seed ball. The presence of a number of modifying genes is also postulated.

1522 *Savitsky, V. F. Relation between the weight of fruit and weight of germ in mono- and multigerm beets.* (*pp. 16–22*).

In multigerm beets the average weight of the seed ball tended to increase but that of the germ to decrease with increasing number of flowers per cluster. In monogerm beets, germ weight was highly and positively correlated with fruit size ($r = 0{\cdot}949$). Monogerm segregants from the F_2 of crosses between monogerm and multigerm varieties and from back crosses had lighter fruits but heavier germs than the multigerm segregants.

1523 *Savitsky, V. F. & Ryser, G. K. Sugar content in mono- and multigerm sugar-beet hybrids, carrying the gene m isolated from Michigan hybrid 18 and the gene m from variety U.S. 22/3.* (*pp. 23–28*).

Beets grown from monogerm fruits taken from heterozygous plants (*Mm*) did not differ significantly in sucrose content from those grown from multigerm fruits from the same plants. Results of crosses between monogerm (*mm*) and multigerm (*Mm*) varieties of high and low sucrose percentages suggest that the locus *Mm* may be linked to one of the factors controlling sugar content.

1524 *Savitsky, H. Self-sterility and self-fertility in monogerm beets.* (*pp. 29–33*).

Self-sterile monogerm lines were developed by the procedure previously described by the author (cf. *PBA*, Vol. XXIII, Abst. 2867). On crossing such lines, which were free of the S^t factor for self fertility, F_1 lines segregating for self fertility and sterility and showing intermediate degrees of self fertility were obtained. This type of inheritance, which is thought to result from the action of modifying genes, occurred only in lines derived from the predominantly self-sterile strain Michigan Hybrid 18.

1525 *Savitsky, V. F. & Murphy, A. M. Study of inheritance for curly top resistance in hybrids between mono- and multigerm beets.* (*pp. 34–44*).

Details are given of the curly-top reactions of monogerm hybrids derived from crosses between susceptible monogerm lines and resistant and susceptible multigerm varieties (cf. *PBA*, Vol. XXIII, Abst. 2867). Resistance appeared to be dominant under conditions of mild infection but not under severe infection. The susceptible monogerm line SLC 101 carried some genes for partial resistance making it slightly more resistant than other susceptible varieties. In crosses with certain susceptible lines SLC 101 gave hybrids with greater resistance than itself. Under severe infection, resistance appeared to be determined by several genes, one of which was linked with the *Mm* locus; there was also evidence of linkage between resistance and the *Rr* factor pair (cf. *PBA*, Vol. VI, Abst. 925). Resistance in F_3 lines was improved if the F_2 ancestors were selected for vigour and fruit quality. Monogerm lines obtained from selfing were generally less resistant than those obtained after open pollination.

1526 *Owen, F. V., Murphy, A. M., Smith, C. H. & Ryser, G. K. Preliminary yield tests with F_1 male-sterile monogerm hybrid sugar beets.* (*pp. 45–48*).

Male-sterile monogerm beets, obtained by crossing cytoplasmically male-sterile multigerm strains with the monogerm line SLC 101 and back crossing to monogerm pollen parents, were hybridized with multigerm varieties, to produce vigorous F_1 hybrids equal or superior in yield to the curly-top resistant commercial variety US 22/3 but inferior in total sugar production to the multigerm male-sterile hybrid SL 944H1. The hybrids were slightly less resistant to curly top than US 22/3.

1527 *Peterson, D. F. A monogerm gene from MW 391.* (*p. 49*).

When the F_1 of a cross between the monogerm line SLC 101 and Holly 13 (MW 391) was back crossed to the latter parent, a single monogerm plant (*mm*) was found among the 700 plants of the progeny. Since the F_1 must have been heterozygous (*Mm*) it is assumed that one of the Holly 13 plants used in the back cross must have been heterozygous too.

1528 *Savitsky, H. Obtaining tetraploid monogerm self fertile, self sterile, and male sterile beets.* (*pp. 50–58*).

Of the tetraploids obtained by colchicine treatment (cf. *PBA*, Vol. XXIII, Abst. 2867) of self-fertile monogerm inbreds, 50% were self sterile, 22·7% male sterile and 27·3% partially self fertile. Tetraploids obtained from male-sterile monogerm diploids were highly male sterile but set some seed when pollinated by the tetraploids obtained from inbred or self-sterile lines. Pollen production and viability and, after cross pollination, seed setting and germination were greater in the tetraploids developed from

self-sterile diploids than in the other tetraploids studied. The F_1 progeny of a cross between a self-sterile tetraploid derived from a self-fertile inbred line and a tetraploid pollen parent originating from a self-sterile line was self-incompatible and showed cross incompatibility in sib crosses; this observation is regarded as being explicable on the oppositional-factor hypothesis.

1529 *Oldemeyer, R. K. General combining ability of sugar beet inbreds as determined with two different top cross testers.* (*pp. 59–63*).

The following significant correlations were found between the combining ability of 16 inbreds as measured by a commercial sugar beet tester and their combining ability as measured by a red-beet tester: $r = \cdot 67$ for yield, $r = \cdot 79$ for sugar percentage and $r = \cdot 52$ for total sugar. The correlations between inbred and top-cross performance of 31 inbreds, using the red beet as tester parent, were $r = \cdot 37$ for yield, $r = \cdot 68$ for sugar content and $r = \cdot 42$ for total sugar. These figures, which were significant, indicate that the sugar percentage of the hybrid is largely determined by that of the inbred component. It is suggested that genes governing sugar content are additive and exhibit little or no dominance.

1530 *Owen, F. V. Hybrid sugar beets made by utilizing both cytoplasmic and Mendelian male sterility.* (*p. 64*).

A scheme is proposed for producing a four-way hybrid (A x B) x (C x D) in which A is cytoplasmically male sterile and C is homozygous for a recessive gene for male sterility such as that found in the line US 35/2.

1531 *Rush, G. E. The relative performance of some nonrogued male sterile hybrids.* (*pp. 65–69*).

Details are given of the performances of hybrids of the almost completely male-sterile seed parents SL 9090M1 and SL 9031M1. Although the occurrence of sib or self pollination among the seed parents would be expected to be accompanied by a reduction in the amount of hybridization no significant differences in performance were found between rogued and nonrogued hybrids of the same pedigree. All nonrogued hybrids with SL 9090M1 as seed parent were superior to the commercial variety US 22/3 in respect of root yield and gross sugar per acre. The sucrose contents of hybrids 1323 and E21 were approximately the same as the mean contents of the parents.

1532 *Reeve, P. A. & Campbell, S. C. Mixing various percentages of the male parent seed with male sterile seed for hybridization and the subsequent effect on the productive ability of hybrids.* (*pp. 70–73*).

Hybrid seed produced by planting male-sterile and pollen-producing seed in 1 : 1 or 4 : 1 mixtures did not differ significantly in yielding ability from that produced by planting the parent seeds in alternate strips.

1533 *Brewbaker, H. E. & Doxtator, C. W. Cooperative testing of inbreds — three years' results — 1951–53.* (*pp. 75–78*).

A table is presented showing the correlations between yield, contents of sugar, Na and K and thin juice purity for 60 inbreds tested at Longmont, Colo. The value of inbreds in breeding is discussed.

1534 *Johnson, R. T. The effect of successive seed increases by the overwintering method on the non-bolting characteristics of two relatively non-bolting varieties of sugar beets.* (*pp. 79–83*).

At Spreckels, Calif., an increase in the percentage of bolting occurred in the varieties US 56/2 and US 75 as a result of producing seed by allowing the plants from seed planted in August to overwinter. Methods are suggested for reducing the effect, which is ascribed to the greater quantities of seed produced by the earliest bolters.

1535 *Johnson, R. T. A rapid method of making a non-bolting selection in sugar beets.* (*pp. 84–87*).

Seed of A5116 was germinated in November, 1951 at 38–40° F. and subsequently grown in an unheated greenhouse at Spreckels, Calif. Early bolters were discarded, later bolters, whose seed was designated A5211, were retained and plants which had not bolted by 1 April 1952 were refrigerated for a month, brought to flowering and their seed (A5240) collected in October 1952. A5211 showed a lower percentage of bolting than A5116, and A5240 than A5211, with significant differences between each group.

1536 *McFarlane, J. S. New non-bolting and mildew-resistant seed releases.* (*pp. 88–89*).

The following nonbolting beets have been released at Salinas, Calif.: NB 1 (S_5 of Cl 179 x Cl 1–707), which is resistant to curly top, downy mildew and rust, is a good seed producer and carries the type O character resulting in male sterility of all offspring from crosses with cytoplasmically male-sterile lines; C361, a selection from US22/3, and its male-sterile equivalent; and C3504 which is a composite of three S_5 lines

from SL51–1 x 4200–14 and has high field resistance to downy mildew, moderate resistance to rust and probably some resistance to curly top.

1537 *Afanasiev, M. M. & Morris, H. E. Testing sugar beet varieties for their resistance to* Aphanomyces, Rhizoctonia *and* Fusarium *root rots.* (*pp. 90–93*).

Among 240 varieties tested under greenhouse conditions at Bozeman, Mont., five showed a high degree of resistance to *Aphanomyces*, 37 to *Rhizoctonia* and 53 to *Fusarium* root rots. Some varieties were simultaneously resistant to two diseases but not to all three.

1538 *Doxtator, C. W. & Finkner, R. E. A summary of results in the breeding for resistance to* Aphanomyces cochlioides (*Drecks*) *by the American Crystal Sugar Company since 1942.* (*pp. 94–98*).

In tests carried out on infested soil at Mason City, Ia., recent selections developed by the above company have shown greater resistance to *A. cochlioides* than earlier selections or current commercial varieties. Resistant inbred lines are now under investigation.

1539 *Murphy, A. M. & Giddings, N. J. Beet varietal and species reactions to the 1953 curly top exposure at Jerome, Idaho.* (*pp. 99–103*).

The reactions of three sugar-beet varieties and the species *Beta trigyna* and *B. patellaris* to moderate and severe natural infections are described.

1540 *Rietberg, H. Possibilities of breeding for tolerance against virus yellows and beet eelworm.* (*pp. 104–08*).

At Bergen op Zoom, Netherlands, a number of inbred lines have been developed equalling commercial varieties in root weight and sucrose content but having greater tolerance of virus yellows. In breeding for eelworm resistance, a hybrid has been produced between sugar beet and the immune species *Beta webbiana.* A method of testing for eelworm tolerance is outlined.

1541 *Swink, J. F. Breeding for resistance to the sugar beet nematode.* (*pp. 109–11*).

At Vineland, Colo., tolerant material has been obtained as a result of three years' breeding for resistance to *Heterodera schachtii.*

1542 *Coons, G. H. et al. Evaluation tests in 1953 of U.S. 400 and related black root- and leaf spot-resistant varieties of the U.S. Department of Agriculture.* (*pp. 112–17*).

Details are given of the root and sugar yields per acre and the percentage sucrose content of US400 and a number of other black-root and leaf-spot resistant varieties and hybrids tested at 13 stations in Michigan, Colorado, Iowa, Minnesota, Ohio and Ontario. SP 521601–01, a hybrid between the leaf-spot resistant beet US 225MS and the black-root resistant variety US 1177 (SP 48B3–0), gave outstanding performances in nearly all localities.

1543 *Artschwager, E. Characterization of sugar beet varieties on the basis of their internal structure together with the effect of environment on the variability of diagnostic characters in inbred lines.* (*pp. 118–24*).

Nineteen inbred lines are described and distinguished on the basis of the following characters: prominence of zonation as seen in cut surface; prominence of zonation as seen in thin cross section against black background; width of vascular rings; width of interzonal parenchyma; and diameter of first ring. The size of the central core and the width of the first ring vary with environment in some varieties.

1544 *Wood, R. R. Breeding for improvement of processing characteristics of sugar beet varieties.* (*pp. 125–33*).

Mass selection for high sucrose content and low Na was effective in the four lines tested but gave no significant increase in total yield of sugar. Differences in K content in 16 varieties appeared to be too low for selection to be effective. Evidence that raffinose content may be reduced by selection was obtained; the character appears to be simply inherited. Varieties showed wide ranges of thin juice purity and should respond to selection for this character.

1545 *Nelson, R. T. Progeny test of sugar beet roots selected for low respiration rate.* (*pp. 134–36*).

Progenies selected for low respiration rate, as measured by the production of CO_2 by sliced roots, respired significantly less rapidly than unselected progenies or those selected for high respiration rate. It is concluded that storage quality may be improved by breeding.

1546 *Bush, H. L. Yield and quality of certain sugar beet varieties harvested at weekly intervals.* (*pp. 137–39*).

In tests carried out with two varieties at Longmont, Colo., a significant interaction between variety and time of harvesting was observed for yield in 1953 and for sugar content in 1952 and 1953. It is concluded that date of harvest should be taken into account when varieties are evaluated.

1547 *Coons, G. H. The wild species of* Beta. (*pp. 142–47*).
Thirteen species are described, five of which pertain to the section *Vulgares*, four to the *Corollinae*, one to the *Nanae* and three to the *Patellares*.

1548 *Gaskill, J. O. Viable hybrids from matings of chard with* Beta procumbens *and* B. webbiana. (*pp. 148–52*).
At Fort Collins, Colo., hybrids between chard (*B. vulgaris* var. *cicla*) and sugar beet failed to survive the seedling stage but healthy F_1 plants, from which it may be possible to transfer desirable genes to sugar beet, have been obtained from crosses of chard (♀) with *B. webbiana* and *B. procumbens*.

1549 *Oldemeyer, R. K. Viable interspecific hybrids between wild species in the section* Vulgares *and species in the section* Patellares *in the genus* Beta. (*pp. 153–56*).
At Longmont, Colo., matings of species in the section *Vulgares* (♀) with species in the section *Patellares* (♂) failed as a result of embryo abortion, lack of fertilization or inviability of the F_1 seedlings. Other crosses, notably those of *B. procumbens* and *B. webbiana* with *B. atriplicifolia*, *B. maritima* and *B. macrocarpa*, produced viable hybrids. One vigorous F_1 plant of *B. macrocarpa* x *B. webbiana* was intermediate in growth habit between the parents and bore flowers similar to those of *B. macrocarpa* but nonfunctional.

1550 *Coe, G. E. A grafting technique enabling an unthrifty interspecific hybrid of* Beta *to survive.* (*pp. 157–60*).
A method is described of raising weak seedlings of *B. vulgaris* x *B. procumbens* to maturity by grafting them on to young sugar-beet stocks.

1551 *Hogaboam, G. J. Time-saving techniques and increased accuracy using the punched card system in experimental work.* (*pp. 161–65*).
Some advantages of using punched cards for all records made during the course of a field experiment are pointed out.

1552 *Archimowitsch, A. Methods of sugar bete selection in the U.S.S.R.* (*pp. 166–72*).
A short review of breeding in the USSR since 1920 is presented.
The methods employed have included mass selection, individual plant selection, inbreeding and controlled hybridization and the chief aim has been high yield, although in the early days of the Soviet régime high sugar content was considered more important; other objectives have been vigour, earliness and resistance to fungous diseases. The article concludes with a list of the breeding stations at present active in the USSR.

1553 *Owens, H. S., McComb, E. A. & Deming, G. W. Composition and percentage of marc in some varieties of inbred sugar beets.* (*pp. 267–71*).
Data are given on the percentages of sucrose and marc in 15 beet varieties and on the anhydrouronic acid, arabinose and galactose contents of the marc. Arabinose content varied according to variety and may respond to selection.

1554 *Owen, F. V. The significance of single gene reactions in sugar beets.* (*pp. 392–98*).
Lines of evidence suggesting that a single gene governs a single biochemical reaction are briefly reviewed. Particular reference is made to the gene *B* for bolting in beet, which, it is suggested, is responsible for the production of a flowering hormone.

1555 *Savitsky, V. F., Ryser, G. K., Rush, G. E. & Parrish, C. P. Inter-relation between weight of seed and fruit and utilitarian characters in inbred lines and hybrids of monogerm sugar beets.* (*pp. 399–403*).
The 1000-germ weight in monogerm beets varied in proportion to the 100-fruit weight. Varietal differences in sugar percentage and yielding ability were maintained irrespective of the size of seed planted. Inbreds and hybrids screened for large fruits produced fewer plants per plot than those selected for small fruits.

1556 *Stout, M. Some factors that affect the respiration rate of sugar beets.* (*pp. 404–09*).
Polyploid beets respired more slowly than diploid varieties, were more resistant to spoilage but showed in many cases an undesirably high increase in invert sugar. The male-sterile equivalent of CT 9 (2*n*) appeared to have a higher sugar content, greater vigour, a lower respiration rate and greater resistance to spoilage than CT 9 itself.

1557 Orlovskiĭ, N. I.
(Breeding and seed production of sugar beet along Mičurin's lines).
Agrobiologija (Agrobiology) 1955 : No. 4 : 52–58. [Russian].
Mičurinist views on breeding and selection of sugar beet are expounded and a scheme of selection, which is to be introduced at all Soviet breeding institutes, is presented. Mention is made of new varieties from the Verhnjačka,

Uladovka, Ivanovka and Ramonj breeding stations; these have a 0·5% higher sugar content and yield 2–6 c. more sugar per ha. than the previous standard in a number of provinces.

1558 Sedlmayr, K.
Polyploide Zuckerrüben. (**Polyploid sugar beets**).
Bodenkultur 1955 : **8** : 235–43.

An account is given of the development of tetraploid and diploid sugar beet varieties at the Sopronhorpács Plant Breeding Institute, Hungary. Treatment of the growing tips of young seedlings with a 0·2% colchicine solution was found to be the most effective method of obtaining tetraploids. Seed from the C_1 generation gave rise to diploid, tetraploid and aneuploid progenies. After cytological studies of the C_1 generation had been carried out to eliminate all diploid and aneuploid plants, the tetraploids and their progenies were submitted to a rigorous selection process for 5–6 generations to improve their vitality, rate of growth, fertility, yield and sugar content. When the resulting lines were then crossed, marked heterotic effects were observed. Crosses between diploid and tetraploid lines of Beta C–53 resulted in high-yielding triploid strains, designated mule beets, that evinced pronounced heterotic effects, giving higher yields of root and leaf and having a higher sugar content than either the diploid or the tetraploid lines. They also contained a remarkably low percentage of bolters. Hexaploid forms of *Beta vulgaris* have also been obtained at Sopronhorpács and selection is being undertaken to improve their vigour and fertility.

1559 Knapp, E.
Zur plasmonisch kontrollierten Pollensterilität der Zuckerrüben. (**On plasmically controlled pollen sterility in sugar beets**).
Züchter 1955 : **25** : 231–36.

After mentioning briefly the advantages and disadvantages of synthetic varieties and male sterility in the exploitation of heterosis in sugar beets, the author goes on to discuss the possible use of cytoplasmically inherited male sterility in the commercial production of hybrid seed (cf. *PBA*, Vol. XVI, Abst. 858). Sugar beets containing the factor *S* for cytoplasmic male sterility were obtained from Owen in the USA (cf. *PBA*, Vol. XIX, Abst. 2727) and crossed, in the first instance, with the German variety Kleinwanzleben E. The progeny of this cross proved 80–85% male sterile and the fertility of the pollen of the remaining 10–20% was considerably impaired, indicating that Kleinwanzleben E contains genes for sterility (designated *x* and *z* by Owen and ms_1 and ms_2 in this paper) which, in combination with *S*, give pollen-sterile progeny in accordance with Owen's hypothesis. By repeatedly back crossing male-sterile plants obtained by this procedure with normally fertile strains, lines of a desired genetic constitution should be obtained which, when crossed with pollen-fertile inbred lines, will give F_1 hybrid seed on a commercial scale. In the second series of experiments, Kleinwanzleben E, Maribo N, Beta 242/53 and Buszczynski CLR were crossed with Owen's beets to discover whether the expression of the genes ms_1 and ms_2 was equally pronounced in all crosses. It was found that a considerably higher proportion of the progeny of Kleinwanzleben E and Maribo N was pollen sterile than of the progeny of the other two varieties.

1560 Fiedler, J.
Příspěvek ke studiu fysiologických podkladů k šlechtění cukrovky vhodné pro sušší oblasti. (**Contribution to the study of physiological characteristics in breeding sugar beet suitable for arid areas**).
Listy cukr. 1955 : **71** : No. 3 : 58–63.

The most suitable methods for determining transpiration rate and degree of drought resistance of sugar-beet lines being bred for adaptation to arid areas were investigated.

1561 Knapp, E.
Kombinierte Prüfung von 6 Zuckerrübensorten auf Leistung und Resistenz gegen *Cercospora*. (**Combined testing of 6 sugar beet varieties for performance and resistance to *Cercospora***).
Z. Zuckerind. 1954 : **4** : 382–85.

Details are given of the performance of six varieties under *Cercospora*-free and infected conditions in cooperative tests conducted in Germany, Switzerland and Austria in 1952–3. The superiority of high-yielding susceptible varieties over resistant beets when sprayed was sufficient to outweigh the additional costs of spraying.

1562 Drachovská, M. & Šandera, K.
Klasifikace stupně napadení cukrovky cerkosporiosou podle elektrické vodivosti tkáně a výluhů. (**Classification of the degree of injury of sugar beet caused by *Cercospora* by means of the electrical conductivity of the tissues and extracts**).
Listy cukr. 1955 : **71** : No. 3 : 65–66.

A method of estimating the degree of injury

caused by *Cercospora*, based on electrical conductivity measurements of the leaves, is described.

STIMULANTS

1563 Bolsunov, I.
La sélection des tabacs dans les pays de l'Europe. (**Tobacco breeding in European countries**).
Rev. int. Tabacs 1955 : **30** : 171–80; 195–206.

In the first half of this article the author presents an historical account of tobacco cultivation in Europe since the original introduction of *Nicotinia tabacum* and *N. rustica* into the Old World, lists the most important European tobacco research stations and describes briefly the work being carried out there, and traces the evolution of the different European varieties and the introduction of new varieties from America during this century. In the second half, the various techniques used in tobacco breeding, such as mass and pedigree selection, intervarietal and interspecific hybridization, the induction of mutations and polyploidy, and the exploitation of heterosis are outlined. Mention is made of results achieved by various research stations in Europe by employing these methods. The author concludes by enumerating the most important aims in current breeding. They include increased yields, improved quality and greater resistance to diseases.

1564 Le tabac au Congo Belge (Haut-Lomami). [**Tobacco in the Belgian Congo (Upper Lomami)**].
Rev. int. Tabacs 1955 : **30** : 182–83.

The results of trials of introductions from America and Indonesia at the Kaniama Research Station are presented. Havana 211 gave the best results of the cigar tobaccos tested and Yellow Mammoth was superior among the cigarette tobaccos (cf. Abst. 1571).

1565 Gutierrez, M. E.
The tobacco breeding program of the Bureau of Plant Industry.
Philipp. J. Agric. 1954 (1955) : **19** : 81–96.

The history of tobacco breeding in the Philippines is reviewed. Recent work has included the following: breeding improved wrapper varieties from crosses of native strains with Florida Sumatra, American Sumatra and Baker Sumatra; hybridization and selection for quality; attempts to combine the large leaf of native varieties with the desirable features of Turkish tobaccos; investigations on the possible use of heterosis for increasing yield in Virginia tobacco and in crosses of Simmaba S3–50–1 with American Sumatra and other strains; the production of wilt resistant and mosaic resistant varieties by hybridization; and the initiation of a programme of crossing numerous varieties to give a product which will largely eliminate the need for factory blending.

1566 Chu, E. H. Y.
The mechanism of transfer of a gene from *Nicotiana glutinosa* to *N. tabacum*.
Genetics 1955 : **40** : p. 567. (Abst.).

"The mechanism of incorporation of chromosome material from *Nicotiana glutinosa* into *N. tabacum* and the effects of a specific *glutinosa* allele on segregation ratios in *tabacum* have been investigated. Since the F_1 *glutinosa-tabacum* hybrid is sterile, it was necessary to use the sesquidiploid obtained from 4*n N. tabacum* x 2*n N. glutinosa*. This 3*n tabacum-tabacum-glutinosa* hybrid as well as subsequent selfed generations were studied in detail, using *tabacum* plants genetically white (*ws*, *ws*) and selecting for the Ws_g factor carried on an extra *glutinosa* chromosome. A chromosome constitution of 24 *tabacum* bivalents + 1 *glutinosa* univalent (Ws_g) was obtained early in the program, and the transmission rates of the Ws_g chromosome were analysed. Pollen and ovule fertility was found to be reasonably high in the sesquidiploid and later generations, but no well defined correlation between fertility and number of alien chromosomes could be established. There were apparently qualitative differences between individual members of the *glutinosa* genome in this regard. Alien addition types with twenty-five pairs were obtained but were unsuitable because of their instability and the undesirable *glutinosa* features introduced. The mechanism of transfer depends primarily on partial homology between chromosomes of the two species. Infrequent trivalent formation or nonconjugation of *tabacum* homologues may result in chance substitution of a *glutinosa* chromosome for one of the *tabacum* complement. Rare association and exchange of segments between *tabacum* and *glutinosa* chromosomes may even lead to incorporation of products of segmental exchange into *tabacum*. Products of these types of behavior were distinguished by segregation ratios of green and white seedlings. Plants having twenty-four pairs and including the Ws_g segment were closely similar to *N. tabacum* when the segment was present in single dose. Homozygous Ws_gWs_g individuals were characterized by various abnormal features

presumably due to the homozygous deficiency in the modified *tabacum* chromosomes."

1567 MATSUMURA, S. & FUJII, T.
(Studies on tobacco mutants induced by X irradiation).
Ikushugaku Zasshi/Jap. J. Breeding 1955 : **5** : 41–46. [Japanese].

Chromosome aberrations and mutations resulting from X irradiation of *Nicotiana sylvestris* and *N. tabacum* are described. The chromosome aberrations included translocations, univalent and fragment formation and asynaptic configurations. Aberration frequency was linearly correlated with X-ray dose. The induced mutants of *N. tabacum* included chlorophyll deficiencies, dwarfs, lethals, a form flowering two weeks earlier than the control and a pubescent type, of possible interest for breeding.

1568 SCARASCIA, G. T.
Aberrazioni chromosomiche indotte in *Nicotiana tabacum* L. da neutroni termici e raggi gamma. **(Chromosome aberrations induced in *N. tabacum* L. by thermal neutrons and γ rays).**
Tabacco, Roma 1955 : **59** : 257–71.

Resting seeds of *N. tabacum* 'Xánthe Yaká' [Xánthe Foot-hills] that had been irradiated with thermal neutrons displayed retarded germination, the extent varying with the dose, $10{\cdot}8 \times 10^{13}$ neutrons/cm.^{2} and over being lethal. Rings, double bridges, acentric fragments and other chromosome anomalies were observed in the root tips from seeds treated with neutrons and with γ radiation, the type of aberrations suggesting that they resulted from presplit fragmentation of the chromosome threads. The relation between frequency of aberration and dose seemed to be linear in the case of the neutrons and exponential for the γ rays.

1569 MONDONEDO, J. R.
Behavior of alkaloids in three successive generations of selected disease resistant Maryland tobacco lines.
Abstr. Diss. Univ. Md. 1955 : **8** : No. 2 : p. 10. (Abst.).

Investigations were carried out on the variability in the alkaloid content of 17 breeding lines during the course of three generations, the standard tobaccos Robinson and Wilson being used as controls. The lines maintained their qualitative and quantitative differences from generation to generation, suggesting that they were homozygous for alkaloid content. Only two lines were similar to Robinson in total alkaloid content and ratio of nicotine : total alkaloids. The remaining lines resembled Wilson in their nicotine : nornicotine ratio. Environmental conditions were responsible for some variation in alkaloid characteristics within a given line.

1570 MADAMBA, U. V. & MALIMBAN, S. B.
Results of a two-year variety test of wrapper tobacco at the Kidapawan Wrapper Tobacco Experiment Station (1950-1952 seasons).
Philipp. J. Agric. 1954 (1955) : **19** : 31–38.

Of five varieties tested at the Kidapawan Experiment Station, Philippines, Baker Sumatra and RG gave respectively the highest and next highest yield and percentage of leaves suitable for wrapping.

1571 VAN LEER, R.
La culture du tabac au Lomami.
(Tobacco cultivation in Lomami).
Bull. INÉAC 1955 : **4** : 357–403.

This account of tobacco cultivation in the Lomami district of the Belgian Congo includes information on the principal varieties grown in the area and on trials of new varieties recently introduced from the American continent, South Africa, Rhodesia, Indonesia, France, Belgium and Italy. At the Kaniama Experiment Station, the cigar tobaccos Sumatra and Havana 211 and the cigarette varieties Kentucky 16, Delcrest and Yellow Mammoth gave promising results.

1572 Maladies et ennemis du tabac au Congo Belge. **(Tobacco diseases and pests in the Belgian Congo).**
Rev. int. Tabacs 1955 : **30** : 211–12.

The variety Sumatra proved comparatively resistant to *Xanthomonas solanacearum* and leaf-spot fungi. No varietal differences in susceptibility to root nematodes were detected.

1573 OKABE, N. & NAITO, H.
(Studies on *Pseud. solanacearum.* VII. On strains of the bacterium responsible for tobacco wilt).
Shizuoka Daigaku Nogakubu Kenkyu Hokoku/Rep. Fac. Agric. Shizuoka Univ. 1954 : No. 4 : 61–66. [Japanese].

Twenty strains isolated from Japanese tobacco plantations were distinguished on the basis of their susceptibility to nine bacteriophage strains. Some strains were local, others widespread, the latter tending to be more virulent.

1574 KINCAID, R. R.
Dixie Shade, a new variety of cigar-wrapper tobacco.
Circ. Fla. agric. Exp. Sta. 1953 : No. S–65 : Pp. 6.

Compared with the standard variety Rg, Dixie

Shade has the advantages of appreciable resistance to root knot, more desirable leaf type, higher yielding capacity, more satisfactory field characters and less susceptibility to spotting on the cured leaves. It has the same degree of resistance to black shank as Rg. Dixie Shade was selected from RK25 [(TI706 x White Stem Orinoco) x No. 400].

1575 McGrew, J. R.
Comparison of some *Nicotiana* species and hybrids for resistance to tobacco anthracnose.
Abstr. Diss. Univ. Md. 1955 : **8** : No. 2 : 24–25. (Abst.).

Data on the reactions of interspecific F_1 hybrids suggested that *N. nudicaulis* and *N. longiflora* are sources of dominant resistance to anthracnose and *N. sylvestris* and *N. occidentalis* sources of dominant resistance of a moderate type. *N. debneyi* appeared to possess polygenic and mainly recessive resistance.

1576 La lutte contre quelques ennemis du tabac au Lomami. (**The control of some enemies of tobacco in the Lomami region**).
Bull. INÉAC 1955 : **4** : 259–78.

A brief note on varietal differences in susceptibility to *Cercospora nicotianae*, *Alternaria longipes* and *Pseudomonas tabaci* at the Kaniami Experiment Station, Belgian Congo, is included.

1577 McLeod, A. G.
Resistance of tobacco varieties to black root-rot.
NZ J. Sci. Tech. 1955 : **37** : 100–02.

At the Tobacco Research Station, Motueka, NZ, a large number of varieties and breeding lines were grown in seedling beds infected with *Thielaviopsis basicola*. The material was graded into four classes according to the results of visual examination of the roots of 30 plants in each line or variety. This classification of reaction agrees closely with the degree of resistance under field conditions.

1578 Haslam, R. J.
Breeding and testing tobacco varieties.
Lighter 1955 : **25** : No. 3 : 13–17.

Work on breeding and testing varieties in Ontario is outlined, chiefly with reference to resistance to black and brown root rots in burley tobacco.

1579 **Tobacco research. Annual Report of the Tobacco Research Station and Cawthron Institute for 1954-55** : Pp. 2.

Two lines resistant to black root-rot have shown both high yielding capacity and good smoking quality; they are to be tested on a larger scale. Mosaic-resistant back-cross lines have been secured. Resistance to mosaic is now being combined with resistance to black root-rot.

1580 Wark, D. C.
A heritable variation in tobacco of palatability to looper caterpillars.
J. Aust. Inst. agric. Sci. 1955 : **21** : 189–92.

Flue-cured and other types of varieties differ in palatability to looper caterpillar (*Plusia argentifera*). In all of the 12 F_1 intervarietal hybrids tested, unpalatability was recessive. Data on the one F_2 generation studied, viz. that of Maryland Mammoth x Virginia Gold, suggested that many genes determined the degree of palatability.

1581 Gutierrez, M. E.
Observations on an unusual symptomatic expression of tobacco mosaic on inoculated Ky 52 (White Burley) and F_1 hybrids thereof.
Philipp. J. Agric. 1954 (1955) : **19** : 97–104.

When the Burley strain Ky.52 and its F_1 hybrids with four local varieties were inoculated with tobacco mosaic virus, foliar necrosis resulted instead of the usual symptoms. Ambalema and its hybrids with the same varieties, treated at the same time, developed the normal form of mosaic. Ky.52 had previously been reported as resistant (cf. *PBA*, Vol. XXIII, Abst. 555).

1582 Vasiljev, A. F.
(**Standardization of tobacco varieties**).
Tabak (Tobacco) 1955 : No. 3 : 54–56. [Russian].

Soviet standards for 1955 include two new varieties bred at the USSR Tobacco Institute. Dubec 566, from (*Nicotiana digluta* x Dubec 44/39) x (*N. ditagla* x Dubec 44/39), surpasses Dubec 44 in yield, notably the amount of high-grade leaves, and is immune from mildew and tobacco mosaic. Perevoločanec (American Devickiĭ x Vengerskiĭ 1782 [Hungarian 1782]) excels the cigar type Havana 1112 in quality and yields 5·5 c. more per ha. It shows resistance to tip chlorosis and bacterial leaf spot.

1583 Bahtadze, K. E.
(**Breeding and seed production of the tea plant**).
Agrobiologija (Agrobiology) 1955 : No. 4 : 179–92. [Russian].

Descriptions are given of recent Georgian selections of the tea plant that surpass hitherto cultivated Soviet strains in yield and leaf quality. They were all obtained by hybridization of China x China or multiple hybridization

(China x India) x (China x India), (China x India) x [(India x China) x China] and direct and reciprocal crosses of China x (China x India). Gruzinskiĭ 1 [Georgian 1] and Gruzinskiĭ 2, direct and reciprocal hybrids of (India x China) x China respectively, yield 30–35% more leaf than the commonly cultivated strains and are the most productive among the new varieties. The leaf of these and also of Selekcionnyĭ [Bred] 3, 5, 6 and 10 is of high quality.

1584 **Annual Report of the Tea Research Institute of Ceylon for the year 1954.** Bull. Tea Res. Inst. Ceylon 1955 : No. 36 : Pp. 64.

In recently established trials, clone 2024 gave a record yield of nearly 4000 lb. per acre and continued to produce teas of above average quality. The performance of clones in longer established trials has been encouraging. Several clones, e.g. 2055, 2086, UR12, OK4 and TK48, showed promise with respect to blister blight.

1585 Flémal, J.
Production de graines et de boutures de théiers à Mulungu. (**The production of tea seeds and cuttings at Mulungu**). Bull. INÉAC 1955 : **4** : 225–37.

An account is presented of clonal trials of Assam tea at the Mulungu Agronomic Research Station, Belgian Congo. New high-yielding clones producing tea of improved quality have been obtained by crossing élite plants.

1586 Tomo, N., Fuchinoue, Y. & Yamane, H. (**Testing resistance to cold by means of the permeability of the leaf cells in tea**).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1955 : **23** : 300–01. [Japanese].

A fuller version of this article was summarized in *PBA*, Vol. XXV, Abst. 3308.

Contributions a l'étude du caféier en Côte d'Ivoire. (**Contributions to the study of coffee in the Ivory Coast**). Bull. Sci. Fr. d'out. mer 1954 : No. 5 : Pp. 495.

The above publication includes the following articles of interest to readers of *Plant Breeding Abstracts*:—

1587 *Jacques-Félix, H. Généralités sur la physiologie, la biologie, la génétique et l'écologie du caféier. (Generalities on the physiology, biology, genetics and ecology of coffee). (pp. 9–150).*

A comprehensive survey of the literature is given and problems confronting the coffee grower in the Ivory Coast are discussed briefly.

1588 *Fressanges, R. La sélection du caféier en Côte d'Ivoire. (Selection of coffee in the Ivory Coast). (pp. 223–31).*

Mass and pedigree selection at the Nanadi and Danané experimental fields and at the Acandjé Central Station is described. Prior to 1925 *Coffea liberica* var. *liberiensis* was the type most commonly cultivated in the Ivory Coast but it has now been largely replaced by the variety Assikasso of *C. liberica* var. *indeniensis*, which gives higher yields and produces berries better suited to the requirements of the consumer in France. Robusta coffee (*C. canephora*), first introduced from the Belgian Congo in 1930, has also gained ground in recent years. It possesses better resistance to *Fusarium xylarioides* and the fruit has a smaller percentage of pulp than Assikasso. It is anticipated that the latter variety will be supplanted eventually by Robusta coffee but, at present, selection work on both types is being carried out.

Proceedings of the West African International Cacao Research Conference held at the West African Cacao Research Institute, Tafo, Gold Coast 1953 : Pp. 100.

The proceedings of the above conference, held to enable an exchange of information to take place between cacao specialists from British and French territories in West Africa, includes the following papers of interest to breeders.

1589 *Tinsley, T. W. The strains of cacao swollen shoot virus occurring in West Africa. (pp. 20–21).*

Work at the West African Cacao Research Institute, Tafo, on the classification of physiological races of the swollen shoot virus is reviewed briefly. Over seventy isolates from different parts of West Africa have been collected and tested on young Amelonado seedlings to obtain information on differences in symptomatology. At least two physiological races would appear to occur in the Ivory Coast, three in Nigeria and five in the Gold Coast.

1590 *Burle, M. Note sur l'état actuel de la culture cacaoyère en A.O.F. et sur les travaux effectués par le Centre de Recherches Agronomiques de Bingerville. (Note on the present state of cacao cultivation in French West Africa and on work carried out at the Bingerville Agronomic Research Centre). (pp. 37–40).*

A brief note is included on current selection

work. The principal aims are increased productivity and improved resistance to swollen shoot and capsids.

1591 *Rogers, H. H. & Knight, R. Some observations on yield trials of cacao at Tafo.* (*pp. 42–48*).

The comparative merits of different layouts used in recent progeny trials at the West African Cacao Research Institute, Tafo, are discussed. It is recommended that large, complicated trials be abandoned as lack of uniformity in soil and shade conditions is often difficult to avoid in such cases.

1592 *Braudeau, J. Travaux de sélection de la Station du cacyaoer de Nkoemvone.* (*Selection work at the Nkoemvone Cacao Station*). (*pp. 71–76*).

An account is given of selection work at the Nkoemvone Experiment Station, French Cameroons, since its foundation in 1949. A collection of some 20,000 trees has been established, including all the types of cacao occurring in the Cameroons and a considerable number of introductions from abroad. Selection for improved quality and resistance to diseases is progressing satisfactorily and élite clones are being propagated vegetatively.

1593 V Reunión del Comité Técnico Interamericano del Cacao. (**Fifth meeting of the Interamerican Technical Committee on Cacao**).
Inst. interamer. Cienc. agríc., Turrialba 1954 : Docum. 3–45.

The report of the meeting held from 4 to 10 July 1954 at the Interamerican Institute of Agricultural Sciences at Turrialba, Costa Rica, contains a number of items of interest to plant breeders. In the section of recommendations reference is made to the collection of cacao clones established at the Quarantine Station at Mayagüez, Puerto Rico, to serve as an international centre for exchange of cacao breeding material. The collection at present comprises some 20 clones from Trinidad, Brazil and Costa Rica. It was recommended that the authorities of cacao-growing countries should make collections of their best clones and subject them to certain basic observations, which are defined. A permanent subcommittee to develop an Interamerican programme for cacao breeding was also recommended.

The papers presented include the following:—

1594 *Holliday, P. Notes on the control of black pod and witches' broom diseases in Trinidad.* (*Docum. 15 : pp. 1–5*).

Control measures discussed include the development of resistant varieties. The technique of inoculation used at the Imperial College of Tropical Agriculture, Trinidad, in testing for resistance to black pod (*Phytophthora palmivora*) is described. SK 28, a Brazilian clone reported to be highly resistant to black pod, has proved as susceptible to leaf inoculation as ICS1. The Amazonian clones SCA6 and SCA12 have shown marked resistance to witches' broom; field records suggest that they may also possess some resistance to other pod diseases.

1595 *Desrosiers, R., Buchwald, A. von & Bolaños, C. W. Mass selection of cacao seedlings for resistance to witches' broom.* (*Docum. 16 : pp. 1–11*).

The indigenous type in Ecuador possesses little resistance to witches' broom (*Marasmius perniciosus*) but wide variation in degree of resistance has been detected among Trinitario seedlings. No evidence has been obtained of any association between pod pigmentation and resistance. Mass selection of seedlings for resistance, by means of artificial inoculation, has led to the establishment of a field planting of 698 survivors at the Tropical Experiment Station. These trees will be further selected prior to clonal multiplication.

1596 *Desrosiers, R., Bolaños, C. W. & Vargas, J. Evaluation of clones of cacao for resistance to witches' broom.* (*Docum. 17 : pp. 1–9*).

For clones not arranged in formal experimental designs, evaluation on the basis of a broom–age ratio has given useful results at the Tropical Experiment Station, Ecuador. This ratio is estimated for a given clone by dividing the mean number of brooms produced by all representatives of the same age by this age in years. Significant differences in resistance have been detected among clones by this method. Before being considered as resistant, a clone should have maintained a consistently low ratio for several years under severe conditions of infection.

1597 *Orellana, R. G. Growth of* Phytophthora palmivora *of cacao in liquid media containing cacao shell from different clones as a basis for assessment of resistance.* (*Docum. 29 : pp. 1–3*).

Preliminary work at the Interamerican Cacao Center, Costa Rica, suggests that clonal resistance may be evaluated by obtaining data on the growth of *Ph. palmivora* on a dry weight basis in the above type of media. Pod inoculation is also considered to be a promising method of testing.

1598 *Burgos L., J. A. Algunos resultados del trabajo experimental sobre cacao en la Estación Experimental Agrícola de Tingo María.* (*Some results of the experimental work on cacao at the Tingo María Agricultural Experimental Station*). (*Docum. 27 : pp. 1–16*).

The work on cacao research in Peru includes observations on some clones resistant to witches' broom selected by F. J. Pound, together with other clones introduced from Trinidad, Ecuador and elsewhere, the yields of which are tabulated. The Pound clones were somewhat inferior in yield but maintained their resistance to witches' broom and are to be used for crossing with the best of the local Criollo clones.

1599 *Naundorf, G. Contribución a la fisiología de la floración en cacao.* (*Contribution to the physiology of flowering in cacao*). (*Docum. 13 : pp. 1–2*).

See Abst. 578.

1600 *Pinto, G. C. P. Notas preliminares sobre a seleção de cacau na Bahia, Brasil.* (*Preliminary notes on cacao selection in Bahia, Brazil*). (*Docum. 37 : pp. 1–13*).

A brief historical note on cacao cultivation in the state of Bahia in Brazil is presented. The trees grown are mostly of the Forastero type, belonging to what is classed as *Theobroma cacao* ssp. *leiocarpa*, three main varieties Común [Common], Pará and Maranhão being recognized. An experimental station for cacao problems has been established and the first selections were made in 1953, number of fruits per tree, freedom from *Phytophthora palmivora* and size of fruit being the initial criteria of selection, later consideration being given to total weight of fruit and of berries per tree.

1601 *García, C. Resultados de la selección de cacao en Colombia.* (*Results of cacao selection in Colombia*). (*Docum. 42 : pp. 1–10*).

Selection is now (cf. *PBA*, Vol. XXV, Abst. 2279) being based mainly on subtypes Angoleta and Cundeamor of the Trinitario group, which combine the Criollo quality with the Trinitario yielding capacity, and on certain outstanding pure Criollo trees. Number of fruits per tree per year varied from 50 to 236, weight of fresh berries from 24 to 118 g. and yield of dry cocoa from 531 to 9549 g. All trees that give under 50% set on selfing are discarded, as are those that display any tendency to form parthenocarpic fruits. Various factors, other than the genetic ones, that may affect yield are discussed.

1602 *García, C. Contribución al estudio de la variabilidad de la población cacaotera de Colombia.* (*Contribution towards the study of the variability of the cacao population of Colombia*). (*Docum. 43 : pp. 1–9*).

Cf. *PBA*, Vol. XXV, Abst. 3316.

1603 *León, J. Una nota sobre "cacao lagarto" o* pentagona. (*A note on "lagarto" cacao or var.* pentagona). (*Docum. 36 : pp. 1–4*).

It is pointed out that the cacao in question is compatible with other cacaos and that in distribution and morphology it conforms most closely to the Criollo group. It is regarded as meriting subspecific rank within *Theobroma cacao* rather than that of a species, variety or form.

1604 *Carletto, G. M. Duplicação do número de cromosomios em cacajeiros.* (*Duplication of chromosome number in cacao*). (*Docum. 41 : pp. 1–4*).

After treatment with colchicine in concentrations varying from 0·0375% to 0·6%, some seedlings were found to have cells with $2n = 40$ in their root tips.

1605 **Annual Report of the West African Cocoa Research Institute 1954-55** : Pp. 110.

Testing of selections and introductions for yield and quality continued. Seedlings of *Theobroma cacao* x *Th. angustifolia* are now nine months old but very slow-growing. The genetic system controlling incompatibility has been elucidated (cf. *PBA*, Vol. XXV, Abst. 3318). Study of the inheritance of many pod and floral characters is under way. Polyploids of *Th. cacao* and three related species have been induced by treating seedlings with colchicine. Further work was carried out on the classification of viruses. Iquitos seedlings have exhibited resistance to the New Juaben virus.

1606 Ducke, A.
As espécies brasileiras do gênero *Theobroma* L. (**The Brazilian species of the genus *Theobroma***).
Bol. tec. Inst. agron. Norte 1953 : No. 28 : 3–20.

Information is given on the geographical distribution of the wild species of *Theobroma* and the species that occur in Brazil are described. These include *Th. mariae* and *Th. camargoanum*, no grounds having been found for recognizing the genus *Herrania*.

1607 Desrosiers, R. & Díaz M., J.
Progreso de la selección de cacao proveniente de semillas para resistencia a la "escoba de bruja". **(Progress in selection of cacao derived from seeds for resistance to witches' broom).**
Agricultura trop. 1955 : **11** : 825–27.

Several thousand seedlings have been grown under conditions favouring infection at the Estación Experimental Tropical [Tropical Experimental Station] in Ecuador and others have been subjected to artificial inoculation. Several segregates from hybrid populations of Trinitario cacao have shown quite a high level of resistance and 752 trees have been selected; some of those that have started to bear give promise of being high yielders, one of them having produced 18 fruits and 1085·2 g. of dry cacao in 1954.

1608 Desrosiers, R.
Diversidad genética del cacao como base en la selección de resistencia a la enfermedad de la escoba de bruja. **(Genetic diversity in cacao as a basis for the selection of resistance to witches' broom disease).**
Turrialba 1954 : **4** : 131–34.

Reference is made to the work of Cheesman and Pound (cf. *PBA*, Vol. XV, Abst. 59 and Vol. XVI, Abst. 1091) on the origin and geographical distribution of cacao species and varieties and of witches' broom. The Trinitario cacao of Ecuador is variable in reaction to *Marasmius perniciosus* and since it is mixed with Criollo by intercrossing may constitute promising material for selecting resistant forms of good commercial quality. Collections of local material are being made in different parts of Ecuador and selection on the lines indicated has already begun, together with a series of crosses between resistant selections and clones possessed of high quality.

Annual Booklet of the Association of Growers of the New Varieties of Hops [England] **1953** : Pp. 31.

1609 *Demand for new varieties and suggestions for planting.* (*pp. 6–8*).

Comments are made on the commercial value of some hop varieties in England.

1610 *Harris, R. V. New* Verticillium *wilt tolerant hop varieties.* (*pp. 10–15*).

A brief survey of breeding for tolerance of *Verticillium* wilt at the East Malling and Wye Stations is followed by information on new seedlings in an advanced stage of production, viz. Bramling Cross (OT48), Whitbread **1147**, C2, D1, D3 and J2.

Annual Booklet of the Association of Growers of the New Varieties of Hops [England] **1954** : Pp. 36.

1611 *Beard, F. H. & Jary, C. L. The new varieties:—a summary of the present position.* (*pp. 4–9*).

Descriptive notes are given on the newer hop varieties, which are classified according to their acceptability to brewers and growers.

1612 *Salmon, E. S. Note on a newly-named hop.* (*p. 19*).

The variety Copper Hop is briefly described (cf. *PBA*, Vol. XXIV, Abst. 3227).

Annual Booklet of the Association of Growers of the New Varieties of Hops [England] **1955** : Pp. 46.

1613 *Jary, C. L. & Beard, F. H. New varieties. Summary of present position.* (*pp. 4–9*).

A descriptive list is provided of the newer varieties, which are classified according to their suitability for meeting the current demands of the industry.

1614 *Smiley, N. B. Institute of brewing trials with Wye varieties of hops.* (*pp. 10–14*).

Various aspects of the trials organized annually by the Hops Advisory Committee of the Institute of Brewing are discussed.

1615 *Amos, A. Comments upon the new varieties.* (*pp. 20–21*).

Comments are made on the commercial status of Brewer's Gold, Bullion, Early Promise and eight other varieties.

1616 *Harris, R. V. Wilt-tolerant hops.* (*pp. 26–28*).

The prospects of the new seedlings Bramling Cross, Whitbread **1147**, C2, D1 and D3 as substitutes for Keyworth's Midseason and Keyworth's Early are considered (cf. *PBA*, Vol. XXIV, Abst. 474).

1617 *Neve, R. A. Wilt tolerant varieties.* (*pp. 31–34*).

The present position with respect to available wilt-tolerant varieties is surveyed. Bramling Cross and Whitbread **1147** cannot yet be recommended without reserve; further farm and brewing trials require to be carried out on D1, D3 and J2. Any suitable selections resulting from crosses made in 1950 between wilt-tolerant males and Fuggle, Whitbread **1147** and Bramling Cross in the joint programme of Wye College and the East Malling Station will not be available to growers before 1963 or 1964.

1618 Keller, K. R. & Likens, S. T.
Estimates of heritability in hops, *Humulus lupulus* L.
Agron. J. 1955 : **47** : 518–21.

Analysis of data obtained from clonal trials at Corvallis, Oreg., revealed a high degree of heritability for the characters studied, with highly significant differences among the lines. The average gains, calculated as percentages of the mean values, expected from selecting the top 5% of the population on a replicated plot basis were: 37% for yield; 40% for sidearm length; 18% for total soft resin content; 18% for β fraction; 51% for α acid; and 14 to 61% for the leaf blade contents of total P, K, Ca, organic N and nitrate N. Correlation coefficients indicated little or no association between the characters.

1619 **Institute of brewing hop trials : 1953 crop.**
J. Inst. Brew. 1955 : **61** : 372–76.

The wilt-tolerant varieties D3, 1147, C2, OT48 and J2 were again tested under commercial conditions (cf. *PBA*, Vol. XXV, Abst. 1312). D3 was the most satisfactory for both copper and dry hopping; it was also acceptable with respect to α-resin and total soft resins contents.

1620 Tatchell, A. R.
Studies on the hop cone. I. Hop deterioration.
J. Inst. Brew. 1955 : **61** : 412–19.

The rate of deterioration of α soft resin during storage proved to be a varietal characteristic. Its dependence on variety was maintained under all the storage conditions studied and was unaffected by season. Deterioration is considered to be an oxidative process which is not necessarily influenced by the activity of micro-organisms.

MINOR CROP PLANTS

1621 Ždanov, L. A.
(The principal results of breeding research on oil plants).
Agrobiologija (Agrobiology) 1955 : No. 4 : 59–71. [Russian].

Sunflower. Mention is made of many new varieties from Armavir, Rostov, Šortandy, Veïdelevka and the Oil Plants Institute. They possess greater earliness than the older varieties and surpass these in productiveness and resistance to *Orobanche*, notably race B. Some are characterized by an oil content of up to 47% and a habit suitable for combine harvesting. At Rostov and Krasnodar, interspecific hybridization is being used to impart disease resistance. Hybrids 4198 and 4168, obtained at Rostov from crosses involving *Helianthus ruderalis*, show resistance to *Nebulella*, *Orobanche* and rust. In recent trials they produced 2·3–3·8 c. more seed than VNIIMK 6540 [Oil Plants Institute 6540] and 82–127 kg. oil per ha.

Mustard. A *Sinapis alba* variety from the Oil Plants Institute and two varieties of *Brassica juncea* from Stalingrad are distinguished by a high yield.

Sesame. New indehiscent forms that lose their leaves before reaching maturity and others notable for a high yield and having capsules with six locules have been obtained by selection or hybridization at various institutes. It was found that open intervarietal pollination increased the oil yield by 14–16%.

Lallemantia. At Rostov, Vysokoroslaja 26 [Tall 26], with a growth habit suitable for combine harvesting, and Don 74 and Don 152, both resistant to *Macrosporium* and bacteriosis, have been developed. In Armenia, a drought-resistant variety Norek has been selected from wild local material.

Linseed. The new varieties Želtosemjannyĭ [Yellow-seeded] and Frunzenec [Frunze Dweller], bred in Kirgizia for cultivation on irrigated land, yield 1·5–2·0% more oil than older varieties. A selection from Voronež is characterized by high yield, good oil content, drought resistance and a habit suitable for combine harvesting.

Groundnut. New productive varieties suitable for cultivation on irrigated land in Transcaucasia and Central Asia or adapted, on account of the short growth period, to cultivation in the Caucasus and the Crimea are listed. Some produce large pods.

1622 Jenkinson, J. G. & Jones, G. D. G.
Observations on the pollination of oil rape and broccoli (*Brassica napus* and *B. oleracea*).
Bee World 1953 : **34** : 173–77.

Selfing of the summer rape Regina and a Roscoff variety of broccoli occurred in the absence of insects but seed yields were considerably greater when the flowers were worked by bees. Air currents played little part in pollen transference.

1623 Togari, Y. & Kanno, C. [K.]
(Survey of crosses made in rape breeding).
Kantotosan Nogyo Shikenjo Kenkyu Hokoku/J. Kanto-Tosan agric. Exp. Sta. 1954 : No. 6 : 113–31. [Japanese].

A report of the performance of rape hybrids at the Experimental Station of the Ministry of

Agriculture and Forestry at Konosu and at the Fukuoka, Osaka, Gifu, Fukui and Fukushima prefectural experimental stations is presented; both Japanese and introduced varieties were used as parents. The varieties that were most satisfactory as parents were: (1) *Brassica napus,* Wasechosen [Early Korean], Isekurodane [Ise Black-seeded], Nakatechosen [Midseason Korean], Fuji [Peerless] and Yokkaichikurodane [Yokkaichi Black-seeded]; and (2) *B. campestris,* Meizairai [Triple Common], Hakusuizairai [Hakusui Common], Inakashu [Rustic], Wasena [Early rape] and Kashimazairai [Kashima Common]. *B. napus* x *B. napus* crosses did better in warmer regions while *B. napus* x *B. campestris* hybrids were more satisfactory further north.

1624 Olsson, G.
Heterosis hos vårrybs. (**Heterosis in spring turnip rape**).
Sverig. Utsädesfören. Tidskr. 1955 : **65** : 215–19.

In continuation of the research described in *PBA*, Vol. XXV, Abst. 1472, a series of further crosses was carried out (*a*) between different cultivated varieties of *Brassica campestris* var. *oleifera* and (*b*) between cultivated varieties of *B. campestris* var. *oleifera* on the one hand and other botanical varieties of *B. campestris* on the other. Heterotic effects were evinced by F_1 hybrids from both groups but were more pronounced in crosses between *B. campestris* var. *oleifera* and *B. campestris* vars. *dichotoma, narinosa, chinensis* and *pekinensis* than in crosses between the different cultivated varieties of *B. campestris* var. *oleifera.* It is therefore suggested that the production of F_1 hybrids should not be limited to crosses between the *oleifera* types but should include other botanical varieties of the *campestris* group.

1625 Kiss, Á.
Hibridizációs kísérletek káposztarepce (*Brassica napus* L. var. *oleifera* Metzg.) és réparepce (*Brassica rapa* L. var. *oleifera* Metzg.) fajok között. [**Interspecific hybridization experiments with rape (*B. napus* L. var. *oleifera* Metzg.) and turnip rape (*B. rapa* L. var. *oleifera* Metzg.)**].
Növénytermelés 1953 : **2** : 134–43.

In work carried out at the Martonvásár Research Institute, Hungary, the self fertility of *B. napus* was low and that of *B. rapa* somewhat higher. Percentage fruit set and the number of seeds per fruit in intraspecific crosses were higher after artificial pollination than after open pollination. In interspecific crosses, fruit set and number of seeds per fruit were higher with *B. napus* as female parent than in the reciprocal cross. When an F_1 intervarietal hybrid of *B. napus* was crossed with *B. rapa,* the fruit set was appreciably greater than in a normal *B. napus* x *B. rapa* cross or its reciprocal. Back crosses of the interspecific F_1 hybrids to either parent gave low fruit sets.

1626 Kuriyama, H. & Watanabe, Y.
Studies on the haploid plant of *Brassica carinata.*
Ikushugaku Zasshi/Jap. J. Breeding 1955 : **5** : 1–5.

A morphological and cytological description is given of a haploid of *B. carinata* which arose from a diploid mother plant pollinated by *Sinapis alba.* The modal metaphase configuration was 17_I; 1–3 bivalents were occasionally observed. Nine offspring showing a reversion to the characteristics of the diploid progenitor were obtained by open pollination of the haploid.

1627 **New semi-dwarf castor bean.**
Seed World 1955 : **77** : No. 2 : 36–37.

Developed jointly by the US Department of Agriculture and the Oklahoma Agricultural Experiment Station, the new semidwarf inbred Custer is resistant to shattering but easily threshed clean; its shelling percentage is outstandingly high. It flowers two weeks earlier than Cimarron, conditions for bloom setting thus being more favourable. Custer is expected to be used both as a variety and as a ♂ parent in hybrid production.

1628 Mazzani, B.
Contribución de las variedades de ajonjolí creadas por el MAC. (**Contribution of the sesame varieties produced by the MAC**).
Agricultor venezol. 1955 : **19** : No. 177 : 12–15, 19.

Several varieties are referred to among the successful products of the Ministerio de Agricultura y Cría [Ministry of Agriculture and Livestock] in Venezuela. Venezuela 51, a selection from an introduction from China, is the earliest; it yields well but being unbranched is somewhat susceptible to drought and lodging. Venezuela 52 was produced from a cross between selection 5 and the local form known as Criolla; it is branched and suitable for mechanized harvesting; somewhat later than Venezuela 51 but earlier than Criolla, it yields well and is tolerant of drought and a wide range of climatic conditions. Acarigua arose from a cross between

selections from introductions from Nicaragua and China; it is exceptionally high in yield, early and unbranched. Morada [Purple] is a selection from an African form; it is branched, free from lodging and in 1952 and 1953 yielded 1229·4 kg. of seed per ha. compared with 1021·2 from Acarigua, 707·5 from Venezuela 51 and 733·6 from Criolla.

Inamar is a hybrid from Venezuela 51; it is branched and early, the fruits ripening very uniformly; it does well under conditions of high humidity and when tested in Japan surpassed all the local varieties.

1629 Ramanathan, K.
Cytology of the backcross between amphidiploid and tetraploid *Sesamum orientale* Linn.
Sci. & Cult. 1955 : **21** : 163–64.

The back cross ($2n = 55$) of the amphidiploid of *S. orientale* x *S. prostratum* to 4*n S. orientale* formed varying proportions of univalents, bivalents and trivalents, a configuration of $16_{I} + 15_{II} + 3_{III}$ being observed in 45% of the PMC. Pollen fertility was 11·2%. No plants have been raised from the four good seeds produced.

1630 Mazzani, B.
Caracteres morfológicos y de fertilidad en el ajonjolí (*Sesamum indicum* L.) indehiscente tetraploide producido artificialmente. [**Morphological characters and fertility in the artificially-produced tetraploid indehiscent sesame (*S. indicum* L.)**].
Agron. trop., Venezuela 1954 : **4** : 119–25.

Tetraploid plants obtained by colchicine treatment of plants of line 53·209 with indehiscent capsules are described; their flowers were larger than the diploids but the anthers were defective and contained a smaller quantity of pollen, which was irregular in size, with a germination percentage of 0–20. Fruit set was low and many seeds were defective. Plants of the second generation of these tetraploids when pollinated with dehiscent tetraploids produced previously (cf. *PBA*, Vol. XXV, Abst. 457) gave a good set of fruits and seeds, though the reciprocal crosses were less successful.

1631 Kinman, M. L. & Stark, S. M. (Jun.)
Yield and chemical composition of sesame, *Sesamum indicum* L., as affected by variety and location grown.
J. Amer. Oil Chem. Soc. 1954 : **31** : 104–08.

Data on the seed yield of 24 varieties grown at 23 locations in the USA are given. From some localities information was also obtained on the oil and protein content of the seed and on the iodine value of the oil. Both variety and location had a marked effect on the chemical composition of the seed.

1632 **Norland flax (Victory C.I.1176) C.A.N. 83 licensed.**
Cereal News 1955 : **2** : No. 3 : 15–16.

Norland, a selection of Victory, is being distributed by the North Dakota Agricultural Experiment Station and has been licensed in Canada. It surpasses the parent variety in yield, rust resistance and uniformity of height and maturity (cf. *PBA*, Vol. XXV, Abst. 3335).

1633 Ono, R.
(**The chromosomes of green perilla**).
Senshokutai (Chromosome)/Kromosomo 1955 : No. 22–24 : 784–85. [Japanese].

Mitosis is figured and described. There are $2n = 40$ chromosomes.

1634 Boguslawski, E. v. & Schuster, W.
Mehrjährige Untersuchungen über Inzucht- und Heterosis-Erscheinungen bei der Sonnenblume (*Helianthus annuus* L.). [**Investigations over several years on inbreeding and heterosis manifestations in the sunflower (*H. annuus* L.)**].
Z. Pflanzenz. 1955 : **35** : 1–26.

Varieties obtained from Hungary, Rumania and northern Caucasia were inbred for up to six generations and crosses effected between different inbred lines from the I_1 to I_6. Inbred lines were characterized by a loss in vegetative vigour, reduced fertility, the frequent occurrence of floral and vegetative aberrations, reduction in seed yield, lower oil content of the seeds and smaller receptacles. Seed yield was the character most affected and was reduced by 47% by six generations of inbreeding; the most marked decline occurred in the I_1, the yield of which was 71% of that of the I_0. Oil content was the least affected of the characters mentioned above, the I_5 having an oil content of 93% of the I_0. Inbreeding was found to exercise no influence on proportion of husks per given weight of seeds or on the size of the infertile zone in the centre of the receptacle. Fertility, plant height, receptacle size, seed yield and oil content fell consistently from the I_0 to the I_4 but remained stable or rose slightly in the I_5 and I_6. Three types of inbreeding were used. Selfing of the same flower in the head resulted in a more pronounced degree of depression than pollination with pollen from another flower within the same head. Plants obtained from crosses

between different individuals of the same inbred line displayed the least degree of depression. It was also shown that self pollen was at a competitive disadvantage compared with foreign pollen. The F_1 progeny of simple crosses between plants of different I_1 or I_2 lines were superior in all respects to their parents. Some were superior to the I_0, others inferior. The F_1 progeny of crosses between I_5 or I_6 lines were, on the average, not superior either to the F_1 of crosses between I_1 or I_2 lines or to the original parental strain. Their range of variability was, however, greater and some plants gave yields up to 60% higher than those of the I_0. It is concluded that, by careful selection of inbred lines with superior combining ability, the production of F_1 sunflower hybrids on a commercial scale may be a practicable means of increasing yields.

1635 Long, R. W. (Jun.)
Hybridization in perennial sunflowers.
Amer. J. Bot. 1955 : **42** : 769–77.

The results of artificial hybridization involving *Helianthus giganteus, H. californicus, H. grosseserratus, H. maximiliani* and *H. nuttallii* indicated that with the exception of *H. nuttallii* the species belonging to this group are very closely related and cross readily with morphologically highly dissimilar species such as *H. divaricatus, H. mollis, H. occidentalis* and *H. salicifolius*. *H. giganteus* and the other species belonging to the above-mentioned group had $2n = 34$ chromosomes; in the interspecific hybrids 17 bivalents were usually formed at meiosis but occasional chains and rings of four, univalents and laggards were observed. Study of populations and herbarium specimens provided evidence that hybridization also occurs readily under natural conditions.

1636 Rojas Mendoza, E. & Swanson, A. F.
Hacia la creación de tipos de girasol resistentes a la roya. (**Towards the creation of types of sunflower resistant to rust**).
Inf. mens. Estac. exp. agríc. La Molina 1955 : **29** : No. 333 : 1–5. (Mimeographed).

In a cooperative breeding programme run jointly by the Morden Experimental Farm in Canada and the La Molina Agricultural Research Station in Peru, two generations are grown each year, one in Peru and one in Canada. Two Canadian selections from a natural hybrid between California Oilseed and Texas Wild Annual have proved rust resistant and have been crossed with various susceptible varieties. Resistance behaves as a simple dominant and it is hoped that good rust-resistant sunflowers for forage purposes will soon be produced.

1637 Rojas M., E. & Swanson, A. F.
Progress report development of rust resistant sunflowers.
Agric. Res. News Notes, Lima 1955 : **2** : No. 2 : 1–2.

Breeding for resistance to *Puccinia helianthi* was initiated in 1950 at La Molina Agricultural Experiment Station, Peru, using as source of resistance a Canadian line derived from the natural cross California Oilseed x Wild Texas Annual. Resistance has exhibited dominance in the F_1. In a cooperative programme with the Morden station, Man., breeding has been hastened by growing one crop in Peru and another in Canada in a single year. Conditions at La Molina are particularly favourable for selecting for resistance during severe attacks. At present tall forage types are being developed but eventually it is hoped that dwarf oil types may prove valuable for the Sierra. The partial sterility of some varieties may prove useful in producing F_1 hybrid seed.

1638 Thomas, C. A.
A new race of safflower rust.
Plant Dis. Reptr. 1955 : **39** : 652–53.

The safflower WO14 and several other selections resistant to the common race of *Puccinia carthami* are susceptible to a new race which has arisen in California. The common and new races have been designated 1 and 2 respectively.

1639 Desassis, A.
La détermination de la teneur en huile de la pulpe de fruit d'*Elaeis guineensis*. (**Determining the oil content of the flesh of the fruit of *E. guineensis***).
Oléagineux 1955 : **10** : 739–44.

Information obtained from the literature on assessing the oil content of *E. guineensis* is summarized and it is concluded that, for selection purposes, a minimum content of 50% per weight of the fresh flesh is desirable.

1640 Pronk, F.
Oliepalm: productie-verwachtingen van het Deli tenera type. (**Oil palm: yield expectations of the Deli tenera type**).
Bergcultures 1955 : **24** : 379–81.

At the AVROS Experiment Station, Medan, Sumatra, selections from crosses between Import tenera and Deli dura palms combined the thick flesh and thin shell of the former with the heavy bunches and good fruit set of the latter type.

Palms of the so-called Deli tenera type, originating either from the above cross or from crosses between Deli dura and Deli pisifera, give the same yield of fruit as Deli dura palms but up to 25% more oil.

1641 **Report of the Wattle Research Institute, University of Natal, South Africa, for 1954-55** (1955) : Pp. 37.

In green wattle (*Acacia decurrens*) x black wattle (*A. mollissima*) time of flowering and several characters of the leaf were inherited on a multifactorial basis. In time taken for the seed to ripen, the two species apparently differ by two major genes, one or the other of which, if dominant, causes ripening in four months from flowering.

Families of black wattle showed significant differences in diameter and incidence of gummosis and wood-rotting fungi (mainly *Amauroderma rugosum* and *Schizophyllum commune*). Compared with open-pollinated families, selfed progenies of green wattle have in most cases suffered from a reduction in vigour, resulting in reduced yield of bark per tree and a much higher percentage of trees failing to strip.

1642 **Wild plant promising as source of tannins : may become farm crop.**
What's New Crops Soils 1955 : **8** : No. 1 : p. 28.

It is reported by B. T. Shaw that improved strains of canaigre (*Rumex hymenosepalus*), with roots suitable for mechanical harvesting and having a tannin content of 35%, have been developed by the USDA Agricultural Research Service.

1643 Symon, D. E.
A hybrid swarm in *Cassia*.
Aust. J. Bot. 1955 : **3** : 190–96.

A population at Alice Springs, central Australia, was intermediate in several characters between *C. desolata* var. *involucrata* and *C. artemisioides* and is thought to be a hybrid swarm of these two species.

1644 Mizgirova, O. F.
(The Turkmenian mandrake).
Problemy Botaniki (Problems of Botany). Akademija Nauk SSSR : 1955 : **2** : 167–205. [Russian].

A monographic account is given of the genus *Mandragora*. From their rhythm of development it is concluded that the members of the genus now found in Central Asia are relics of the tertiary flora. They are classified as a distinct species, *M. turcomenica*, forming a link between the Mediterranean and Himalayan groups. It has large edible aromatic fruits which ripen in autumn; they are high in vitamin C content and have valuable medicinal properties. The plants are cold resistant, perennial and tolerant as regards growing conditions and are thought to be of interest for cultivation and possibly for crossing with other Solanaceous genera. The vegetative parts contain hyoscine, hyoscyamine and other alkaloids. The plants can be reproduced from seed and vegetatively and breeding work is in progress with the object of removing the slight smell of unripe tomatoes characteristic of the fruits of the wild forms and generally to improve the quality and yield. Attempts to cross it with tomato and sweet pepper have so far been unsuccessful as have all efforts to graft it with these plants, with potato or other Solanaceous plants.

1645 Angulo Carpio, M. D.
Estudio cariológico de una nueva planta con colchicina. **(Caryological study of a new plant with colchicine).**
Genet. iber. 1954 : **6** : 101–11.

A cytological study of *Androcymbium gramineum*, a liliaceous plant occurring in the Spanish province of Almería and in North Africa, and containing colchicine in its seeds and bulbs, showed that $2n = 18$; the idiogram is described and illustrated. At meiosis 9 bivalents were present but certain irregularities associated with stickiness were observed.

The method of extracting the colchicine is described. The product, when submitted to the *Allium* test, was in every way similar to colchicine prepared from *Colchicum*.

1646 Chandler, C. & Barton, L. V.
Morphological and physiological studies of diploid and tetraploid *Plantago ovata* Forsk.
Contr. Boyce Thompson Inst. 1955 : **18** : 193–214.

A detailed account is given of the investigations referred to in Abst. 619.

1647 Aanbevolen Heveaplantmateriaal 1955/56. **(Recommended *Hevea* planting material, 1955-56).**
Bergcultures 1955 : **24** : 447–51.

These recommendations, issued by the experimental stations of the Central Association of Experiment Stations, Bogor, give information on clones recommended for large-scale and small-scale planting in Indonesia. The merits of certain seedling families, some of hybrid origin and some from self pollinations, are also discussed.

1648 Institut des Recherches sur le Caoutchouc en Indochine. Rapport Annuel 1954. (**Institute of Research on Rubber in Indochina. Annual Report, 1954**) 1955 : Pp. 213. (Mimeographed).

Information is given on breeding work and clonal trials at experimental stations in Viêt-Nam and Cambodia, with special reference to research at the Laikhê and Tapao Experimental Stations. Of clones included in the 1954 trials, PR107 proved superior. Of the IRCI series, clones 6 and 7 gave the best results when grown on red soil at Tapao. PR107 and PB86 suffered a less pronounced reduction in yield as the result of drought than other clones. Yield comparisons between clones and seedling progenies have shown that the latter are often the more productive. It is postulated that the lower yield potential of the clones is due to the flow of sap being slowed down at the point of grafting. Good results have been obtained from legitimate and illegitimate seedlings, especially from crosses between different clones of the IPPC series. A high positive correlation (+ 0·83) was established between growth rate and yield of latex per cm. of incision, the association between these two characters being attributed to their both being dependent upon the rate at which nutrients are transported from the roots to the vegetative portions of the plants. It is therefore suggested that measurement of the growth rate of young seedlings provides a simple and practical method of selecting for high yield potential. A large number of crosses have been effected between different clones, the most promising results being obtained from Dj.1 x Tjir 1 and the reciprocal, OYI x Tjir 1, Waring 4 x AVROS152 and AVROS152 x BR2. Illegitimate seedlings of Tjir 1, BD5, Waring 1 and Waring 4 have also given good results. Seedling progenies of which Pil B84 was the ♀ parent gave exceptionally poor results. Among recent introductions from abroad are GT1, WR101, LCB1320, Pat 190 and a number of clones resistant to *Dothidella ulei* obtained from the Rubber Research Institute, Malaya. The results of trials of different stocks for grafting are given.

1649 Evers, E.
Description de trois clones primaires d'Hévéa choisis à Yangambi. (**Description of three primary rubber clones selected at Yangambi**).
Bull. INÉAC 1955 : **4** : 239–58.

Detailed descriptions are given of the morphological characteristics of the young plant and adult tree of three new clones selected at the Yangambi Research Station, Belgian Congo, during the past decade. The highest yields are obtained from Y3/46, which is resistant to brown bast, produces latex of extremely good quality and enjoys a long period of economic bearing. It grows slowly in the juvenile stage and has a soft, supple bark. The young plants, when grown on light soils, are susceptible to attack by *Helminthosporium* sp. A hardy clone adapted to soils of medium fertility, Y 24/44 gives moderate yields of good quality latex. It grows vigorously and has a soft, supple bark. Although it gives high yields only slightly inferior to those of Y 3/46, Y 384/69 is highly susceptible to physiological disorders and is not suitable for large-scale plantings. On account of its slow growth and small crown it may be of value as a shade tree in cacao and coffee plantations.

1650 Liefstingh, G.
Op grote schaal aanbevolen Heveaplantmateriaal in de praktijk. (***Hevea* planting material, recommended for large-scale planting, in practice**).
Bergcultures 1955 : **24** : 429–33.

Data compiled at the Central Experimental Station, Bogor, Sumatra, on the performance of clones and seedlings previously recommended for large-scale planting in Sumatra and Java are presented. The best results have been obtained from clones LCB1320 and PR107 and from seedlings of Tjir 1 x Tjir 16. Tjir 1 has given disappointing yields. PR107 can be tapped for a greater number of years than the other clones tested.

1651 Liefstingh, G.
Resultaten van drie rubbertoetsproeven. (**Results of three rubber trials**).
Bergcultures 1955 : **24** : 438–47.

The results of trials are presented in which 15 new clones were compared with PR107 at three centres in eastern Sumatra. Of the six clones that gave higher yields of rubber than the control, four are adjudged unsuitable for wide-scale cultivation. They are AV255, which proved highly susceptible to leaf diseases; PB123 and Pat 190, both of which suffer severely from wind damage; and AV470, the yield of which varies considerably according to soil and climatic conditions. The two other clones, WR101 and GT1, appear suitable for planting on a wide scale. WR101 is susceptible to brown bast and GT1 to mildew, but not to a sufficient extent to cause a significant reduction in vigour or yield.

1652 Paardekooper, E. C.
Heveazaailingen als plantmateriaal. (*Hevea*, seedlings as planting material).
Bergcultures 1955 : **24** : 433–38.

The results are presented of experiments carried out at the Bogor Research Station, Sumatra, to determine the most suitable parents for the production of seedling material. Trees grown from seed obtained by selfing Tjir 1 and LCB1320 gave good results, as did also the seedling progenies of BR2 x PR107 and Tjir 1 x Tjir 16. Crosses between Tjir 1, PR107 or LCB1320 on the one hand and Djas 1, Pat 190, War 4 or Pilm B84 on the other also produced good planting material.

1653 Gerstel, D. U., Hammond, B. L. & Kidd, C.
An additional note on the inheritance of apomixis in guayule.
Bot. Gaz. 1954 : **115** : 89–93.

The use of *Parthenium stramonium* to pollinate 52 F_1 plants of a cross between a sexual diploid ($2n = 36$) and an apomictic polyhaploid ($2n = 37$) of *P. argentatum* (cf. *PBA*, Vol. XXI, Abst. 550) gave hybrid seedlings, 39 of which when examined indicated that meiotic reduction had occurred in all the female parents. It is suggested that apomixis is controlled by not less than four recessive genes, at least two being concerned with meiotic reduction and another two with the need for fertilization. It is pointed out that the expression of factors for parthenogenesis may be hindered in a meiotically reducing diploid individual by an inability of the haploid ovum to undergo further development.

FRUITS AND NUTS

The Annual Report of the Agricultural and Horticultural Research Station, Long Ashton, Bristol 1954 : Pp. 207.

1654 *Williams, R. R. Pollination requirements of cider apple varieties: II. Progress report, 1954.* (*pp. 38–46*).

The varieties previously studied and additional ones (cf. *PBA*, Vol. XXIV, Abst. 569) fell into three groups: (1) varieties setting an appreciable crop when selfed; (2) apparently self-sterile varieties; and (3) varieties giving unexpected results. In the last group many varieties were cross sterile. The results suggested that the reactions of a variety in self and cross pollinations differ from season to season. Self sterility could often be attributed to triploidy but the number of $2n$ varieties showing self sterility was nevertheless high.

1655 *Williams, R. R. Perry pears and their characters: II.* (*pp. 52–57*).

A further 11 varieties are described and illustrated (cf. *PBA*, Vol. XXV, Abst. 1338).

1656 *Burroughs, L. F. The production of cider fruit on bush trees. Vintage quality trials: concluding report.* (*pp. 173–78*).

Notes are included on the vintage quality of 12 apple varieties with good orchard behaviour.

1657 *Crang, A. & Sturdy, M. A comparison of some varieties of vegetables preserved by canning and by freezing: progress report III.* (*pp. 187–91*).

The results of processing tests on pea and bean varieties are summarized.

1658 *Crang, A. & Sturdy, M. A comparison of some varieties of fruit preserved by bottling and by freezing: progress report V.* (*pp. 192–93*).

Information on the preserving qualities of 15 raspberry and 9 strawberry varieties is provided.

1659 Wellington, R.
Growers grew these varieties 75 years ago.
Amer. Fruit Gr. 1955 : **75** : No. 12 : 11, 31–32.

Information is provided on the varieties of apple, cherry, peach, plum, quince, grape and small fruits grown in the USA 75 years ago.

Second Annual Report of the Scottish Horticultural Research Institute, 1954-1955 (1955) : Pp. 38.

1660 *Wood, C. A. Pomology.* (*pp. 14–19*).

Raspberry. Intervarietal and interspecific hybridization continued at the Mylnefield station, Dundee.

1661 *North, C. Vegetable culture.* (*pp. 19–21*).

Brassica. Plants from intervarietal crosses of cabbage and Brussels sprouts were selected for selfing and back crossing.

1662 *Reid, R. D. West of Scotland Unit (Auchincruive).* (*pp. 29–34*).

Strawberry. The objectives and techniques of breeding at Auchincruive are reviewed. Investigations on *Fragaria* spp. as sources of red-core resistance have been extended; recently seed collections of *F. chiloensis*, *F. virginiana* and *F. ovalis* were obtained from the USA. Improved techniques of testing for red-core reaction have been developed. Artificial illumination has been applied to overcome problems of germination.

The following varieties have been used in differentiating races of red core: Royal Sovereign, Huxley, Oberschlesien, Perle de Prague, Auchincruive 6, Auchincruive Climax, Auchincruive 11 and Aberdeen. Three races have so far been identified.

Ten subclones of Climax derived from individual plants selected in 1950 as outstandingly healthy have developed symptoms of yellows ranging from severe attack to a very mild form of transient yellows. Progeny testing in which the proportion of yellow seedlings in a family is regarded as a means of predicting the liability of a parent variety to mutate to the yellow condition may not be reliable, since (1) in the case of varieties such as Climax, known to be prone to yellows, the proportion of yellow seedlings produced is related to the degree of development of the condition in the parent plant, and (2) under mercury vapour lamps yellow seedlings were observed in all batches, even those raised by selfing varieties previously free from yellows.

Raspberry. Further crosses were effected with the aim of developing varieties adapted to the west of Scotland and suitable for the fresh market and processing.

1663 *Reid, R. D. The new strawberry variety "Talisman". (pp. 35–36).*

Talisman, bred at Auchincruive and introduced in spring 1955, is described (cf. Abst. 687).

1664 Uljjanihin, L. U.
(30 years of work on fruit trees).
Agrobiologija (Agrobiology) 1955 : No. 4 : 366–67. [Russian].

High-quality apples, pears and apricots bred in recent years at Mičurinsk include the apple hybrid Babuškino [Grandmother] x Beljfler Želtyi [Yellow Bellefleur] and the pear hybrid Bere Zimnjaja Mičurina [Mičurin's Winter Beurré] x Bessemjanka [Seedless], which are winter varieties with good keeping properties. Among the apricots, Plodorodnyi Uljjanihina [Uljjanihin's Prolific], from Tovariščˇ [Comrade] x Sacer, is notable for high yield, hardiness and moderate soil requirements.

1665 Belohonov, I. V.
(Creative utilization of the theory of I. V. Mičurin).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1955 : No. 10 : 12–15. [Russian].

New apple varieties produced by the Mičurin Institute and its branch stations are mentioned. Some ripen 7–9 days earlier than the older varieties, have larger fruits of superior quality, are more productive and come early into bearing. The new winter varieties are characterized by very late maturation and good keeping properties and excel Antonovka in these respects. Some of the new varieties are adapted to cultivation in Siberia.

1666 Jakovlev, P.
(Mičurin's theory, a creative reforming force).
Socialist. Seljsk. Hozaĭstvo (Socialist Agric.), Moscow 1955 : No. 6 : 3–13. [Russian].

Mention is made of new productive and hardy varieties of pome and stone fruits, black currant, gooseberry and strawberry, bred by the successors of I. V. Mičurin.

1667 Sjubarova, Ė. P.
(Breeding fruit trees in the White Russian SSR).
Agrobiologija (Agrobiology) 1955 : No. 4 : 156–62. [Russian].

Apple. Minsk 26/57–11 is distinguished among late varieties by hardiness and high quality; it was developed at the White Russian Horticultural Research Station by open pollination of Wealthy and is characterized by large fruit, early bearing and resistance to fungi.

Pear. Bere Lošickaja 75/61/11 [Loša Beurré 75/61–11] (Bere Sluckaja [Sluck Beurré] x Moldavka Kurskaja [Kursk Moldavian]) is notable for hardiness, earliness and resistance to fungi.

Cherry. A sour cherry and a few varieties of sweet cherry, all notable for large fruit and hardiness, have been developed.

Plum. A number of high-yielding hardy large-fruited hybrids have been obtained, notably from the crosses of Očakovskaja Želtaja [Yellow Očakov] with Paskeviča [Paskevič's] plum or damson. Belorusskaja 103/28 [White Russian 103/28], from the first mentioned cross, shows resistance to fungous diseases.

1668 Sidorenko, M. F.
(Scientific achievements—for the kolhoz and sovhoz orchards).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1955 : No. 11 : 47–51. [Russian].

Apricot. At Melitopolj new hybrids with different maturation dates have been developed; some ripen 10–15 days before Krasnoščekiĭ [Red Cheek], others 15–30 days afterwards.

Sweet cherry. New productive large-fruited varieties include Melitopoljskaja Rannjaja [Melitopolj Early] and Skorospelka [Early], distinguished by earliness and fruits twice as large as those of Rannjaja Marka [Early Mark].

Gooseberry. Hybrids 35–52, 39–62 and 16–39,

which all have Zaporožje as their ♀ parent, are characterized by high yield, large fruit and resistance to *Sphaerotheca.*

Strawberry. Melitopoljskaja Rannjaja [Early Melitopolj] is notable for earliness, drought resistance and good flavour.

1669 Kostyk, P. P.
(**Breeding fruit trees and soft fruits in Kabarda**).
Agrobiologija (Agrobiology) 1955 : No. 5 : 87–89. [Russian].

Pome fruits. New apple varieties have been bred at Naljčik; they are distinguished by high yield, large fruit and good flavour. Some show resistance to scab. Belaja Roza [White Rose] (Snežnyĭ Kaljvilj [Snowy Calville] x Antonovka), Avgustovskoe Beloe [White August] and Kabardinskoe Krasnoe [Red Kabarda] (Astrahanskoe Krasnoe [Red Astrahanj] x Suĭslepskoe) ripen in August, thereby filling the gap between Papirovka and Landsberg Reinette. Others, for instance Zarja 1–14–5 [Dawn 1–14–5], are characterized by late maturation and good keeping properties. Breeding pears for hardiness and resistance to fungi is in progress.

Stone fruits. Recent selections of plum include Naljčinskaja Krasavica [Naljčik Beauty] and Mirabelj Rozovaja [Pink Mirabelle], both notable for high yield and good quality. Breeding apricots, cherries and peaches for hardiness and resistance to diseases is referred to. Some exceptionally hardy peaches and nectarines have been obtained by raising hybrids from the stones of an open-pollinated southern variety. They produce fruits weighing up to 180 g.

Strawberry. A number of interspecific hybrids between cultivated and wild strawberries have been produced. Most are highly productive and have a good aroma and flavour and some, for instance Kabardinskaja Rannjaja [Early Kabarda], ripen early.

1670 Kobel, F.
Pflanzenzüchterische Arbeiten. (**Plant breeding work**).
Schweiz. landw. Z. 1955 : **83** : 1078–84.

The following research items reported by the Federal Experiment Station for Viticulture and Horticulture at Wädenswil, Switzerland, are of interest to plant breeders:—

Apple. Schweizer Orangenapfel [Swiss Orange], from Ontario x Cox's Orangenreinette (= Cox's Orange Pippin), has been obtained from a programme of crosses carried out to develop late-ripening varieties with good keeping properties, of which there is a dearth in Switzerland. The fruit has a good appearance and a pleasant, mild taste.

Raspberry. Two new varieties developed at Wädenswil are described. Andenken an Paul Camenzind [Souvenir of Paul Camenzind] gives high yields of attractive berries possessing a good flavour and is well-adapted to light, well-ventilated acid soils. It is not, however, suited to calcareous soils or to conditions of excessive soil moisture. Rote Wädenswiler [Red Wädenswil] produces medium-sized berries of excellent flavour but is late in ripening. A number of further crosses are to be carried out in an attempt to combine early maturity, large berries and attractive flavour.

Strawberry. The principal aim in the strawberry breeding programme is to develop varieties with large berries of good flavour. Among the achievements of the station are Wädenswil 3, Wädenswil 4 and Wädenswil 5 (cf. *PBA*, Vol. XXV, Abst. 1332). It has been demonstrated that virus-free stocks can be maintained by cultivation at high altitudes and it is hoped by this means in future to prevent virus degeneration of new varieties.

Grapes. Blauburgunder has been crossed with a number of other varieties in an attempt to combine its desirable features with earlier maturity and improved resistance to grey mould. It is hoped in time to breed a red-wine grape equal in yield and quality to Riesling x Sylvaner, a cross developed at the station some years ago.

Onion. The results of experiments in breeding varieties with improved keeping quality are given.

Cabbage. Selections of the Sauerkraut variety Thurner-Kabis [Thurner cabbage] have longer leaves, a reduced percentage of stalk and other fibrous matter and increased resistance to disease, as compared with the initial variety. Selection of Sauerkraut varieties for improved keeping quality and a shorter period to maturity is also meeting with success.

French bean. The principal objectives of the breeding programme are improved quality of the beans and increased resistance to rust. The new variety Frühe Wädenswiler [Early Wädenswil], from the cross Julibohne [July bean] x Genfer Markt [Geneva Market], matures early and gives good yields of high-quality beans with a marked lack of stringiness.

1671 Jakovlev, P. N.
(**Ivan Vladimirovič Mičurin**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1955 : No. 10 : 4–7. [Russian].

This article refers to hardy large-fruited varieties

of fruit trees and soft fruits bred by Mičurin, notably the apples Pepin Šafrannyĭ [Saffron Pippin] and Beljfler Kitaĭka [Bellefleur Chinese Crab], which are standards in many provinces of the USSR, and to his breeding methods which have helped to extend horticulture towards the north and east.

1672 Groszmann, H. M.
Hybrid vigour in horticultural crops.
Qd. agric. J. 1955 : **81** : 79–82.

A brief general discussion of the possibilities of F_1 hybrids of fruits and vegetables is given. In Queensland F_1 tomatoes have proved more prolific than commercial varieties in the winter but when tested as an autumn crop they have usually given an unsatisfactory performance.

1673 Gorškov, I. S.
(Master the principles of Mičurin's theory).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1955 : No. 10 : 8–11. [Russian].

Varieties of apple, apricot, cherry, plum, currant, gooseberry and citrus fruits produced by Mičurin's successors, mainly by interspecific hybridization, are named. The following hardy wild species and forms were involved: Siberian crab, *Prunus ussuriensis, P. spinosa, P. insititia,* a currant from the Lena basin and a *Sphaerotheca*-resistant gooseberry from the Altaĭ.

1674 Haskell, G.
Man, polyploidy and fruit tree growing in Britain.
Evolution, NY 1955 : **9** : 291–301.

The role of polyploidy in the cultivation of apples and cherries was studied by calculating the ratios of the numbers of polyploid to 2*n* trees,7 or more years of age, for each county of England and Wales, using data from the Orchard Fruit Census issued in 1951 by the Collection of Statistics Branch of the Ministry of Agriculture. Ratios were mapped for the apples Bramley's Seedling (3*n*) and Cox's Orange Pippin (2*n*) and for varieties of *Prunus cerasus* (4*n*) and *P. avium* (2*n*), the distribution of 2*n* and polyploid varieties being examined in relation to several factors, e.g. economic characters, compatibility, frost resistance and the geology of the underlying rocks. Relatively more polyploid trees are grown in northern England. Self fertility might be expected to influence varietal choice, as being preferable under the more rigorous conditions of the north, but the ratios for apples and cherries in each county were not correlated, indicating that the influence of self fertility is overlaid by other factors related or unrelated to polyploidy. The restricted range of the wild self-compatible 4*n P. cerasus* compared with the wide distribution of the wild self-incompatible 2*n P. avium* supports this conclusion.

1675 Zwintzscher, M.
Die Auslösung von Mutationen als Methode der Obstzüchtung. I. Die Isolierung von Mutanten in Anlehnung an primäre Veränderungen. **(The induction of mutants as a method of fruit breeding. I. The isolation of mutants with reference to primary changes).**
Züchter 1955 : **25** : 290–302.

The results are presented of X-ray treatment of apple, plum and cherry carried out at the Max Planck Institute for Breeding Research, Voldagsen, Germany, with a view to inducing useful mutations and to exploring methods of detecting the existence of mutant cell tissue before it becomes overgrown by the unaffected cells surrounding it. Irradiation of the tops of young growing trees was found to be the most practical method as it obviated the need for subsequent grafting. About 4000 r. was the most suitable dose for all three species. Approximately twice as many sectorial and periclinal chimeras were obtained in diploid as in tetraploid varieties; in addition, marked differences were observed between varieties in their sensitivity to irradiation. It was found advantageous to cut back progressively any normal vegetative growth from irradiated stems in order to give mutant tissue a better opportunity of manifesting itself. The mutants obtained included both periclinal and sectorial chimeras and consisted of forms with chlorophyll-deficient, bifurcate, concave, asymmetric or funnel-shaped leaves and bifurcate shoots.

1676 Nazarjan, E.
(Horticulture in Bulgaria).
Kolhoz. Proizvod. (Collect. Fm. Prod.) 1955 : No. 10 : 44–45. [Russian].

Reference is made to a number of Bulgarian varieties of apple, peach and dessert grapes, which are all characterized by high quality and good transportability. Mention is also made of productive annually bearing pears and thin-husked walnuts with an oil content of up to 73%.

1677 Thagušev, N. A.
(I. V. Mičurin's remarks on Adygean orchards).
Agrobiologija (Agrobiology) 1955 : No. 4 : 172–77. [Russian].

Descriptions are given of Čerkessian (Adygean)

land varieties of apple, pear, plum, walnut and hazel, all characterized by high yield, good quality, longevity and resistance to pests and diseases. All the apple and some pear varieties possess good keeping properties.

1678 Konoplev, V. F.
(The work progresses every year).
Agrobiologija (Agrobiology) 1955 : No. 4 : p. 373. [Russian].
Some new hybrid varieties of apricot and vine from Lipeck province are characterized by hardiness and a short growing period.

1679 Tveritnev, F. G., Rozanov, B. S. & Zeman, G. O.
(The research of the Mičurinists in Tadžikistan).
Agrobiologija (Agrobiology) 1955 : No. 4 : 353–55. [Russian].
Mention is made of hardy forms of kaki and pomegranate, obtained by selection among material trained for winter hardiness in Tadžikistan.

1680 Belohonov, I.
(Achievements of Mičurinist science —into production).
Kolhoz. Proizvod. (Collect. Fm. Prod.) 1955 : No. 10 : 40–42. [Russian].
Many new varieties of pome, stone and bush fruits, bred at the Mičurin Horticultural Institute and its branches, combine hardiness and high quality. Mention is made of apples distinguished by earliness or good keeping properties, drought-resistant pears and plums, *Sphaerotheca*-resistant or spineless gooseberries, strawberries adapted to cultivation in Siberia and vines in central Russia.

1681 Sergeeva, K. D.
(Along Mičurin's road).
Zemledelie (Agriculture) 1955 : No. 9 : 34–40. [Russian].
Among the achievements of Mičurin's successors in breeding fruit trees and soft fruits adapted to cultivation in central Russia, new hardy varieties of apple, apricot, plum, gooseberry, strawberry and vine are listed. All of them produce high quality fruit; some apples are distinguished by earliness, others by good keeping properties; the gooseberries show resistance to *Sphaerotheca*.

1682 Howes, F. N.
History and development of the cultivated fruits (Part VIII).
Rev. Ass. Agric., Lond. 1955 : No. 29 : 12–22.
Part VIII in this series (cf. Abst. 655) presents a popular account of the origins of the banana and the pineapple, their dissemination throughout the tropical and subtropical areas of the world by the early Spanish and Portuguese navigators and their introduction into Europe as edible fruits.

1683 Michiels, A. & Semal, J.
La moniliose des arbres fruitiers.
(Moniliosis of fruit trees).
CR Rech. Inst. Rech. sci. Industr. Agric., Bruxelles 1955 : No. 15 : Pp. 111.
A brief note on varietal differences in the susceptibility of apples, pears, plums and cherries to *Sclerotinia fructigena, S. laxa, S. laxa* var. *mali* and *S. laxa* var. *pruni* is included in this treatise on the biology and control of *Sclerotinia* spp. in fruit trees. Reinette Étoilée [Starry Reinette], Wealthy and Court-pendu [Short-hanging] were the most resistant of the apple varieties tested.

1684 Faccini, G. C.
La distribuzione geografica delle varietà di melo e di pero coltivate in Alto Adige.
(The geographical distribution of the varieties of apple and pear cultivated in the Italian Tyrol).
Riv. Ortoflorofruttic. ital. 1955 : **39** : 363–78.
An account is given of the principal varieties grown at the turn of the century, the changes that have come about in the course of this century and the order of popularity of the main varieties according to statistics collected in 1948–49. The most popular apples were Rosa di Caldaro (= Kalterer Böhmer), Gravenstein and Renetta di Champagna [Champagne Reinette], and the most popular pears were Williams and Calebasse Bosc.
Brief descriptions are given of the main varieties grown.

1685 Schander, H.
Keimungsphysiologische Studien an Kernobst. II. Untersuchungen über die allgemeinen Temperaturansprüche der Kernobstsamen während der Keimung.
(Studies on the physiology of germination in pome fruits. II. Investigations of the general temperature requirements of the seeds of pome fruits during germination).
Z. Pflanzenz. 1955 : 34 : 421–40.
The results of studies on the optimal temperatures at which apple and pear seeds germinate and the effect of changes in temperature upon germination are reported as a preliminary to

carrying out experiments on the possibility of preselecting for frost resistance in germinating seeds. Time between swelling of seed and the emergence of the radicle was found to be 30–40 days and frequently longer. Optimum temperature for germination was 2–5° C and varied according to variety. Graphs are presented to illustrate differences in the course of germination at various temperatures and the effect of changes in temperature upon germination (cf. *PBA*, Vol. XXV, Abst. 2317).

1686 Schander, H.
Keimungsphysiologische Studien an Kernobst. III. Sortenvergleichende Untersuchungen über die Temperaturansprüche stratifizierten Saatgutes von Kernobst und über die Reversibilität der Stratifikationsvorgänge. (**Studies on the physiology of germination in pome fruits. III. Comparative varietal studies of the temperature requirements of stratified seed of pome fruits and of the reversibility of the stratification processes**).
Z. Pflanzenz. 1955 : **35** : 89–97.

Experiments with stratified seed of two apple varieties and one pear variety showed the optimum temperature for germination to be between 3 and 4° C. in each case. Seeds of the apple variety Bittenfelder Sämling [Bittenfeld Seedling] and the pear variety Lange Winterbirne [Long winter-pear] proved to be more sensitive to high soil temperatures upon sowing than were seeds of Grahams Jubiläumsapfel [Graham's Jubilee apple]; it is therefore suggested that seeds of the former two varieties be sown more thickly when the soil temperature is above 5° C. Experiments were also carried out to obtain information on the possibility of reversing the stratification process. Seeds of the three varieties mentioned were stratified for 60 days at 3° C. and for 30 days at −1° C. and were subsequently air-dried for a further 65 days at approximately 0° C. Their percentage germination was, however, not lower than that of seeds that had been stratified for the same period but had not been air-dried, thus indicating that the stratification process is irreversible (cf. Abst. 1684).

1687 Visser, T.
Problemen bij stuifmeel van fruitgewassen. (**Problems concerning pollen of fruit trees**).
Meded. Dir. Tuinb. 1955 : **18** : 856–65.

The literature on methods of collecting, treating, storing and applying pollen is summarized with special reference to pome fruits.

1688 Žavoronkov, P. A.
(**Using Mičurin's methods in horticulture in the southern Urals**).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) 1955 : Ser. biol. : No. 5 : 28–41. [Russian].

An account of breeding work on pome fruits at Čeljabinsk is given and two new hardy small-fruited apple varieties and many pears, all distinguished by good quality and hardiness, are described. Most of the new pears are hybrids between *Pyrus ussuriensis* and large-fruited varieties such as Lesnaja Krasavica [Forest Beauty]; others have been raised locally from the seed of Russian varieties.

1689 Bolonjaev, A. V.
(**New apple and pear varieties for the Far East**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1955 : No. 10 : 38–41. [Russian].

The apple varieties from Habarovsk are distinguished by hardiness and the best of them produce fruits weighing up to 67·8 g. They were obtained by crossing crabs or reinettes with the large-fruited Russian varieties and some crosses involved the use of mixed pollen. The new pears, obtained by fertilizing cultivated forms of *Pyrus ussuriensis* by the pollen of good European varieties, are adapted to cultivation in most districts south of 48–49° N.

1690 Granhall, I.
Äppelodlingens sortproblem. (**The variety problem in apple cultivation**).
Sverig. pomol. Foren. Årsskr. 1954 : 91–96.

The disadvantages of some of the apples now grown in Sweden are noted and the need for varieties with greater winter hardiness, productivity, disease resistance and adaptation to the Swedish climate is emphasized. Material under trial at Balsgård, Sweden, shows promise.

1691 Klein, L. G.
Introducing the "Wellington" apple.
Fruit Var. hort. Dig. 1955 : **10** : p. 18.

The variety Wellington (Cortland x Crimson Beauty), recently introduced by the New York State Agricultural Experiment Station, shows very early and uniform ripening. Although not outstandingly good in dessert quality, it is probably better than other varieties with the same season of ripening.

1692 Zaec, V. K.
(Apple breeding in the Central Belt of the RSFSR).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1955 : No. 11 : 45–47. [Russian].

Varieties bred by Mičurin and his successors now supersede the older forms in many districts of central Russia. Most are distinguished by large fruit, high yield, hardiness, annual bearing habit and other good characteristics. Some late-season types keep better than Antonovka. Among the new summer apple varieties producing high quality fruit is Desertnoe Isaeva [Isaev's Dessert], which is hardy and a good annual cropper.

1693 Nieuwe appelrassen. **(New apple varieties).**
Fruitteelt 1955 : **45** : p. 960.

Brief particulars are given of three new apple varieties recently developed at the Laboratory for the Cultivation of Horticultural Plants, Wageningen, Netherlands. Jan Steen produces high yields of attractive, dark-red fruit somewhat similar in taste to that of Cox's Orange Pippin but with a refreshing, acid tang. The fruit ripens at the beginning of November and keeps until the following February. The second new variety, Close, ripens 4–8 days before Yellow Transparent and has much the same taste as the latter variety. The fruit, however, is more attractive in appearance. Rode Astrakan [Red Astrakhan], the third new variety described, has no connexion with the long-established variety of the same name. It gives exceptionally high yields of large fruit that ripens at the same time as Stark Earliest.

1694 Černenko, S. F.
(A memorial to our teacher).
Agrobiologija (Agrobiology) 1955 : No. 4 : 123–27. [Russian].

Many apple varieties that supply fresh or stored fruit throughout the year have been bred by the present writer at Mičurinsk. The breeding value of different groups of varieties such as various forms of Antonovka and Anis, with notes on the characters they impart to their progenies, is discussed. It was found that hybrids from crosses where both components were central Russian varieties were hardier than when one was a Mičurin or a south European variety. By way of exception the following hardy varieties have a southern variety as the pollen parent: Suvorovec (Antonovka x Simirenko Reinette), Oranževoe [Orange] (Borovinka x Simirenko Reinette) and Partizanka [Partisan] (Borovinka x Winter Golden Pearmain); Paradoks Letniĭ [Summer Paradox], also distinguished by hardiness, is a hybrid between two southern varieties (Candille Sinap x Rozmarin Belyĭ [White Rosemary]).

1695 Isaev, S. I.
(Using a root mentor in breeding fruit trees).
Agrobiologija (Agrobiology) 1955 : No. 4 : 142–48. [Russian].

At Mičurinsk, the hardiness of young apple hybrids was improved by training them upon the stocks of hardy hybrids instead of growing them on their own roots. Most grafted hybrids also produced larger and sweeter fruits. Varieties obtained by the use of the mentor method include Narodnoe [People's] (Beljfler Kitaĭka [Bellefleur Chinese Crab] x Papirovka), Grušovka Rannjaja [Early Pear] (Grušovka Moskovskaja [Moscow Pear] x Papirovka) and Yunyĭ Mičurinec [Young Mičurinist] (Papirovka x Beljfler Kitaĭka). They are hardy and produce high quality fruit ripening in summer.

1696 Kedrin, S. P.
(New apple varieties from the Volga basin).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1955 : No. 10 : 36–38. [Russian].

Descriptions are given of Dočj Papirovki 21796 [Papirovka's Daughter 21796], Gostinec 475 [Gift 457], Kutusovec 2485, Volžskoe Zimnee 2619 [Volga Winter 2619], Kuĭbyšev 3331 and Volžskiĭ Šafran [Volga Saffron], obtained by intervarietal hybridization at Kuĭbyšev and distinguished by high yield, hardiness and good quality.

1697 Ščigljuk, A.
(Along the road shown by Mičurin).
Kolhoz. Proizvod. (Collect. Fm. Prod.) 1955 : No. 10 : p. 20. [Russian].

At Černjahov, Ukraine, the new apple varieties, Kohanka [Sweet-heart], Černjahovka, Zimnjaja Antonovka [Winter Antonovka] and Mičurinka [Mičurinite] have been bred; they are distinguished by early bearing and good keeping properties. New cherries include a large-fruited annually bearing variety Šedevr Ščigljuka [Ščigljuk's Chef-d'oeuvre]. It was obtained by fertilizing Rannjaja Lotovaja [Early Lotovaja] with the pollen of Rozovyĭ Napoleon [Pink Napoleon] + Ukrainian Griotte.

1698 Nikonenko, M. N.
(Apple breeding at the oldest horticultural station of the Ukrainian SSR).
Agrobiologija (Agrobiology) 1955 : No. 4 : 336–38. [Russian].

New apple varieties obtained at Mleev by wide

crossing, notably of Russian varieties with American, are characterized by late ripening and high quality. In recent trials most of them have outyielded old-established varieties by a good margin.

1699 Johansson, E.
En mutation i fruktfärg hos äpplesorten Åkerö. (**A mutation in fruit colour in the apple variety Åkerö**).
Sverig. pomol. Foren. Årsskr. 1954 : 184–85.

Branches of the Swedish local variety Åkerö grafted on to Sävstaholm produced mutant branches bearing apples resembling those of Sävstaholm but leaves of the Åkerö type. The tree from which the scion was taken was later found to bear similar mutant branches.

1700 Dermen, H.
Three additional endogenous tetraploids from giant apple sports.
Amer. J. Bot. 1955 : **42** : 837–41.

Entirely 4*n* shoots were obtained adventitiously and endogenously from chimeras of Delicious, Ontario and Wrixparent of the type 2*n*–4*n*–4*n*, using a disbudding technique developed by the author. It was definitely established that no leaf or branch traces extended from the bases of the 4*n* shoots into the pith of the mother stems.

1701 Dermen, H.
A 2-4-2 chimera of McIntosh apple.
J. Wash. Acad. Sci. 1955 : **45** : 324–27.

Cytological investigations of adventitious buds of a large-fruited sport of the apple variety McIntosh (cf. *PBA*, Vol. XVIII, Abst. 1810) confirmed the hypothesis that this sport arose as a periclinal chimera having a 2–4–2 constitution and later changed to the 2–4–4 condition. Sister trees propagated from the sport tree were used to produce adventitious shoots, some of which proved to be diploid and one tetraploid. The possible value of the tetraploid form in crosses with diploids to produce triploid seedlings is discussed briefly.

1702 Saec, V. K.
(**The role of variety in suppressing periodicity of bearing in apple**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1955 : No. 10 : 23–26. [Russian].

Differential behaviour of varieties at Mičurinsk is described and material characterized by regular annual cropping or various degrees of periodicity is listed separately, each group including old-established and new selections.

1703 Šapošnikov, P. G.
(**Along the road of Mičurin**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1955 : No. 11 : 61–62. [Russian].

Uglič, Jaroslavlj and Murzilka have been raised from the seed of unidentified varieties at Uglič and are characterized by good quality and hardiness.

1704 Johansson, E.
En mindre vanlig sektorialchimär i tetraploid äpplesort. (**A rather unusual sectorial chimera in a tetraploid apple variety**).
Sverig. pomol. Foren. Årsskr. 1954 : 186–87.

Two fruits with russet sectors have been found in different trees of an unspecified smooth-skinned tetraploid variety at Alnarp, Sweden.

1705 Gould, E.
Some new styles in apple varieties.
Rep. Md. agric. Soc. 1955 : No. 39 : 133–38.

A short discussion of the practical value of early-colouring bud sports is followed by descriptions of such sports of Delicious, Richared Delicious and Starking Delicious.

1706 Thiele, I.
Künstliche Zwillingsbildung bei Äpfeln durch Samenteilung. (**Artificial production of twins in apples by seed division**).
Züchter 1955 : **25** : 313–15.

A technique is described by which it is possible to obtain twin seedlings of identical genetic constitution by cutting the pip in two prior to germination. This method was found to be more satisfactory than root division; in addition, by combining the two methods, four trees of identical genetic constitution can be obtained.

1707 Spirina, V. V.
(**Local seedlings and varieties of apple from the Nikoljsk district**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1955 : No. 10 : 46–47. [Russian].

The trees described, which occur in the Vologda province, are distinguished by hardiness and high yield; they were mostly raised locally from the seed of central Russian or Crimean varieties.

1708 Černenko, S. F.
(**For the quicker study and introduction of new apple varieties**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1955 : No. 10 : 20–23. [Russian].

Mention is made of apple varieties, bred by the

writer, that are being tested in districts as far apart as Leningrad and Naljčik and Minsk and Čkalov. Most of them are notable for high quality, good cropping and resistance to diseases. Some, notably Oranževoe [Orange] and Pepin Černenko [Černenko's Pippin] are especially hardy, the former growing well in the Leningrad province and the latter in Siberia.

1709 Kolesnikova, A. F.
(The role of multiple hybridization in apple breeding).
Agrobiologija (Agrobiology) 1955 : No. 5 : 73–79. [Russian].

New hybrids distinguished by hardiness, large fruit and good flavour have been produced at the Mičurin Horticultural Institute and its branches in central Russia and Siberia. Forms possessing the above characteristics were mainly obtained by crossing Mičurin's hybrid varieties with central Russian varieties, notably Antonovka and Papirovka, or by crossing Mičurin varieties among themselves. The crosses of Mičurin varieties with south European or American varieties gave progenies characterized by reduced hardiness, although some hybrids between Mičurin and American varieties gave late forms with large fruit. Forms adapted to cultivation in northern districts of Russia and Siberia were only obtained when hardy Reinette hybrids were crossed with hardy central Russian varieties.

1710 Grozdov, K. D.
(Apple varieties obtained by popular selection in Tjumenj).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1955 : No. 11 : 51–52. [Russian].

Brief descriptions are given of some Siberian land varieties notable for productiveness and hardiness. They produce small fruits of fair flavour, the largest, those of Sejanec Sokolovoĭ [Sokolova's Seedling], weighing 86 g.

1711 Birjukov, A. P.
(An experiment on breeding fruit trees in the Transural).
Agrobiologija (Agrobiology) 1955 : No. 5 : 90–92. [Russian].

Hardy varieties of apple, cherry and plum have been bred in recent years at Ščadrinsk, Kurgan province. Some were selected for good flavour and large fruit from local material; others were obtained by multiparental pollination, using adapted local forms as the ♀ parent.

1712 Lisavenko, M. A.
(I. V. Mičurin and Mičurinist experimenters as pioneers of the apple in Siberia).
Agrobiologija (Agrobiology) 1955 : No. 4 : 128–41. [Russian].

This account of apple breeding contains descriptions of many small-fruited varieties that are hardy under the climatic conditions of Siberia.

1713 Bolonjaev, A. V.
(Breeding the apple in the Far East).
Agrobiologija (Agrobiology) 1955 : No. 4 : 149–55. [Russian].

A number of hybrids bred at Habarovsk are hardy and produce fruits that weigh up to 60 g. Their flavour is good.

1714 Tihonov, N. N. & Tolmačeva, A. S.
(New small-fruited apple varieties).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1955 : No. 10 : 41–43. [Russian].

Some hardy seedlings and the hybrids Smena [Change] (Arkad x Siberian crab) and Dobrynja (Siberian crab x Korobovka) from Krasnojarsk are described briefly. Smena shows resistance to scab.

1715 Roby, F.
Las principales variedades de peral cultivadas en Argentina. **(The principal varieties of pear cultivated in Argentina).**
Rev. Invest. agríc. B. Aires 1953 : **7** : 25–68.

Descriptions of 13 pear varieties grown in Argentina are presented, with information on their self and cross compatibility relationships, origin, dessert quality and time of maturity.

1716 B., N.
S. Maria—Incrocio Morettini William x Coscia 29. **(S. Maria, a Morettini cross of William x Coscia 29).**
Riv. Ortoflorofruttic. ital. 1955 : **39** : p. 523.

The S. Maria pear, produced by A. Morettini from the cross indicated, is described as ripening 8–10 days sooner than Williams and having large fruits of good flavour suitable for transportation and for keeping. The variety has been patented.

1717 Lobanov, G. A.
(Improve the pear varieties in the Central Belt of the USSR).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1955 : No. 10 : 32–34. [Russian].

Breeding work on pears at Mičurinsk, Voronež, Saratov and Kuĭbyšev is briefly surveyed and

new varieties that combine high quality and hardiness are mentioned. Some of these ripen late, a characteristic rare among the existing varieties.

1718 Mileško, A. F.
(Promising pear varieties for the southern provinces of the USSR).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1955 : No. 11 : 52–55. [Russian].

Descriptions are given of Dekanka Meroda [Merod's Doyenné] and a number of west-European varieties, which have been tested at the Crimean Horticultural Research Station and are recommended as standards in southern districts of the USSR. Dekanka Meroda is distinguished by high quality, productiveness, hardiness and resistance to fungi. The other varieties equal Dekanka Meroda in most of these respects.

1719 Sapožkov, I. A.
(Changing old varieties of fruit trees).
Priroda (Nature), Leningrad 1955 : No. 11 : 97–98. [Russian].

In Moscow, the fruit quality of the cultivated pears Tonkovetka [Thin Branch], Bessemjanka [Seedless] and of a wild pear from the Aldan valley was improved by grafting them on red-fruited and black-fruited *Sorbus* stocks and on an *Amelanchier* stock respectively. Tonkovetka grafted on *Sorbus* also became self fertile. The seed progeny of the Aldan pear, grafted on *Amelanchier*, resembles the latter in leaf shape and leaf colour.

1720 Schmadlak, J.
Beobachtungen über das Verhalten von Birnensorten auf Quitte A mit und ohne Zwischenveredlung (Gellert) nach Vernichtung der Unterlage. [**Observations on the behaviour of pear varieties on quince A with and without an interstock (Gellert) after the destruction of the stock**].
Arch. Gartenb. 1955 : **3** : 167–74.

Marked varietal differences were observed in the behaviour of pear varieties grafted on to quince stock when the root system of the latter had been killed by frost in the severe winter of 1953–54. Most pear scions died the following spring after growing a few shoots, which withered as soon as they had exhausted the available reserves of sap in the plant. Scions of the variety Gellert, which has a low transpiration rate, survived considerably longer than all other varieties, in some cases sufficiently long to allow the stock to develop a new root system. When used as an interstock, Gellert also reduced the mortality rate of other varieties.

1721 Anjou, K.
Lagringsförsök med päron vid Institutionen Balsgård. (**Storage trials with pears at Balsgård Institute**).
Sverig. pomol. Foren. Årsskr. 1954 : 103–17.

Fifteen varieties tested at Balsgård, Sweden, during the seasons 1951–4 all deteriorated rapidly when stored without refrigeration but kept well at 1–3° C., Conference having the best storage quality.

1722 Tihonov, N. N.
(An experiment on the production of hardy pears in Siberia).
Agrobiologija (Agrobiology) 1955 : No. 4 : 163–71. [Russian].

Descriptions are given of a number of small-fruited varieties from Krasnojarsk that are hardy under Siberian conditions. They were obtained by distant hybridization involving central Russian, Mičurin or European varieties as seed parents and *Pyrus ussuriensis* as the pollen parent. Sibirjačka [Siberian] and Sladkaja [Sweet], both having Bere Kozlovskaja [Kozlov Beurré] as the ♀ parent, are outstandingly hardy. Their fruits weigh up to 70 g. and will keep for about a month when picked in September.

1723 Plock, H.
Über die Kurzlebigkeit der Birnensorten auf Quitte. (**On the short life of pear varieties on quince**).
Mitt. Klosterneuburg 1955 : **5** : 244–46.

Information is given on the comparative degree of frost resistance of the principal varieties of pear grown in Germany. As it has been shown that frost resistance and graft compatibility with quince are closely correlated, the data provided should be of use in predicting the graft compatibility of German pear varieties.

1724 Jakovlev, P. N.
(Mičurinist methods of directing the development of fruit trees).
Agrobiologija (Agrobiology) 1955 : No. 4 : 7–16. [Russian].

Breeding work, notably distant hybridization of stone fruits, at Mičurinsk is discussed. Mention is made of new varieties of apricot that are tolerant of −39° C. and produce fruits weighing up to 35 g. They were obtained by crossing south European varieties with the hardy forms bred by Mičurin. A cross between *Prunus besseyi* and the apricot variety Krasnoščekii [Red Cheek] has given a fertile F_1. This was

intermediate between the parents in leaf and shoot characteristics, but produced fruits of the *P. triflora* type. The hybrid bred true when open pollinated. Another distant hybrid, *P. besseyi* x *P. tomentosa*, bore fruits resembling *P. acida*, suggesting that, contrary to the general view, *Prunus acida* has not evolved from *P. fruticosa*.

1725 Rjabov, I. N. & Kostina, K. F.
(New varieties of peach and apricot bred at the Nikita Botanical Garden).
Agrobiologija (Agrobiology) 1955 : No. 4 : 208–19. [Russian].

White and yellow-fleshed varieties of canning peach, mostly hybrids between American forms, are described. They ripen earlier than the standards, have good technological properties and some, notably Žemčužina [Pearl] and Jubileĭnyĭ [Jubilee], both from Champion x Greensborough, are very hardy. Mention is also made of some new apricots showing resistance to spring frost and sudden low temperatures in winter. These were mainly obtained by crossing large-fruited European or Irano-Caucasian varieties with the late-flowering small-fruited forms from Asia Minor. The latter imparted protracted dormancy and late flowering to the hybrids.

1726 Šaĭtan, I. M.
(The production of new varieties of peach and apricot for cultivation in the Ukrainian SSR).
Agrobiologija (Agrobiology) 1955 : No. 4 : 220–22. [Russian].

The Polessk peach (Avgustovskiĭ 163 x Mao-Tha-Or seedling 446), originating from Kiev, is distinguished by high yield, hardiness, drought resistance and large fruits of high quality. Mention is also made of a productive hardy apricot hybrid (Apricot 80 x Manjčžurskiĭ [Manchurian]).

1727 Jones, R. W. & Thompson, L. A.
Instruments for emasculating flowers of stone fruits.
Proc. Amer. Soc. hort. Sci. 1955 : **65** : 279–82.

The making and use of two instruments is described: (1) a V-notched blade for cutting the calyx cup of the bud and removing all the unwanted flower parts; and (2) a pair of forceps with cut-out portions in the jaws so that the calyx cup can be cut without injuring the ovary. The latter instrument is particularly useful for removing the perianth and stamens of flowers with twisted or recurved styles.

1728 Strokov, S. I.
(Interesting seedlings of stone fruits).
Agrobiologija (Agrobiology) 1955 : No. 4 : p. 368. [Russian].

A plum seedling from Iljinskoe, Moscow province, is distinguished by greater earliness than Skorospelka Moskovskaja [Moscow Early] and a cherry seedling by ultra-late ripening. The latter produces a good crop of cherries in September or October.

1729 Venjjaminov, A. N.
(Achievements in breeding stone fruits).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1955 : No. 10 : 26–30. [Russian].

Mention is made of new apricot varieties from Mičurinsk, Voronež and Moscow, all capable of overwintering in the Central Chernozem Belt, and others from the Crimea, central Asia and Krasnodar characterized by late emergence of buds, thereby escaping frost injury.

1730 Kolesnikova, A. S.
(Northern apricots).
Priroda (Nature), Leningrad 1955 : No. 10 : 94–96. [Russian].

Uspeh [Success], Triumf Severnyĭ [Northern Triumph], and Podarok [Gift], obtained by hybridization at Mičurinsk, are hardy under the severe climatic conditions of central Russia. They are productive and their flavour is good.

1731 Muhammad Asghar Ginai
Plum growing in Baluchistan.
Agriculture, Pakistan 1953 : **4** : 307–17.

The article includes descriptions of the characteristics and uses of 38 varieties.

1732 Enikeev, H. K.
(Using Mičurin's methods in the production of new plum varieties for the northern and central zones of the Soviet Union).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) 1955 : Ser. biol. : No. 5 : 12–27. [Russian].

This account of breeding plums for hardiness at Kuĭbyšev, Moscow, Leningrad, Minsk and Mičurinsk includes data on the hardiness, yield and size of fruit and notes on the flavour of many new varieties. Wide crossing has been used extensively, involving *Prunus ussuriensis, P. triflora, P. nigra, P. americana, P. divaricata, P. insititia* and other forms. However, productive and hardy forms have been mainly produced by (1) intervarietal crossing, using adapted local varieties, (2) crossing central Russian material, notably the variety Skorospelka Krasnaja [Red

Early], with large-fruited European or American varieties and (3) crossing domestic varieties with *P. insititia* or *P. spinosa*.

1733 Enikeev, H. K.
(Four new plum varieties).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1955 : No. 11 : 55–59. [Russian].

Renklod Severnyĭ [Northern Gage], Pamjatj Timirjazeva [Timirjazev's Memorial], Iskra [Spark] and Fioletovaja [Mauve], all from the Moscow Horticultural Research Station, are distinguished by hardiness, high yield and good quality. They were obtained from crosses between the central Russian variety Skorospelka Krasnaja [Red Early] and southern varieties Victoria and Renklod Zelenyĭ [Green Gage] respectively.

1734 Kovalev, N. V.
(The importance of the myrobalan in breeding stone fruits).
Problemy Botaniki (Problems of Botany). Akademija Nauk SSSR : 1955 : **2** : 223–60. [Russian].

An examination of some 7000 specimens in the collection of the Soviet Institute of Plant Industry has led the author to recognize six species, *Prunus cerasifera, P. ursina, P. caspica, P. iranica, P. media* and *P. sogdiana*, together constituting the section *Cerasiferae*. The myrobalans were first taken into cultivation in Iran and adjacent countries, where a number of excellent varieties exist; the same process is now taking place in the North Caucasus, the Crimea and neighbouring areas; collections have been made of many forms that may be promising for breeding or for prolonging the ripening season. Some of the hybrids from these selections display improved consistency of flesh, keeping quality or yield; some of them ripen by 10–15 July, others as late as 13 August and all are resistant to cold and to the main fungous diseases.

Reference is made to the role of *P. cerasifera* in the origin of the cultivated plums (cf. *PBA*, Vol. VII, Abst. 764) and the opinion is expressed that the tetraploid and hexaploid hybrids, once formed, have further crossed among themselves, with *P. spinosa* and with the myrobalan in forming the wide array of both tetraploid and hexaploid forms now found growing in the wild state; these hybrids, being phasically juvenile and plastic, are regarded as specially favourable material for the operation of selection. Artificial crosses have been made of forms of *P. cerasifera* sspp. *boreali-caucasica* and *pontica* with several Burbank and other varieties of *P. salicina* and some have given promising hybrids; these include high-yielding hybrids from Burbank x myrobalan; crosses of Santa Rosa x myrobalan distinguished by aromatic fruit with firm flesh of high quality; hybrids of Beauty x myrobalan with high yield and quality; hybrids of Beauty x myrobalan with high yield and quality of fruit; Šabo x myrobalan hybrids resistant to frost; and frost-resistant hybrids of Japanese Yellow (*P. salicina*) x myrobalan giving high yields of fruit with very firm flesh. All these hybrids are resistant to *Monilia* and leaf spot, have larger fruit than *P. salicina* and exceed it in frost resistance. In crosses with *P. munsoniana* the myrobalans have produced hybrids with increased disease resistance and winter hardiness, combined with good yield, and complex American hybrids such as Burbank's Shira and Hansen's Waneta and Omaga have given hybrids with superior hardiness and freedom from disease and more aromatic fruit, some of them with a flavour of honey. One of the hybrids from Waneta withstands temperatures of −40° C. and can be grown as far north as Moscow.

The above hybrids illustrate the value of the Mičurin principle of wide crossing, *P. cerasifera* contributing resistance to high and low temperatures and to diseases, *P. salicina* contributing better fruit and flesh quality, aroma, good flavour and keeping capacity. A further series of hybrids was obtained by pollinating some of Hansen's interspecific cherry hybrids with *P. cerasifera* ssp. *boreali-caucasica*; they survived temperatures of −37·5° C. undamaged, were more disease resistant than the Hansen hybrids and better in flavour. Some of the natural hybrids of *P. erythrocarpa* and *P. tianshanica* occurring in the Tian Shan were also pollinated with *P. cerasifera*, giving rise to hybrids which were sterile in the first generation but fertile in the second. The fruit size also increased and in the third generation it is expected that promising forms for growing in the arid regions of Central Asia may appear.

Pollination of the myrobalan with apricots has led to a large number of natural hybrids in Central Asia; they are more winter hardy than the apricot and since they flower 7–10 days later they suffer less from spring frosts; moreover, they are resistant to *Clasterosporium* and other diseases and pests. Though most of them were self sterile they bear well when either late-flowering apricots or myrobalans are present for pollination. Hybrids have been obtained artificially by pollinating the myrobalan with mixed apricot pollen; in the first generation

their fruit was inferior in quality and later generations will have to be produced.
Brief descriptions are given of all the most interesting natural and artificial hybrids referred to in the text.

1735 Enikeev, H. K.
(The production of new plum varieties in the Central Belt of the RSFSR).
Agrobiologija (Agrobiology) 1955 : No. 4 : 223–29. [Russian].
Several new varieties from Mičurinsk are notable for high yield, hardiness and good fruit quality. Most of them were obtained by crossing the adapted local plum Skorospelka Krasnaja [Early Red] with south European varieties such as Altana gage. Others are hybrids between Mičurin varieties or interspecific hybrids between cultivated American varieties and *Prunus ussuriensis*.

1736 Haskell, G. &. Dow, P
The stamen patterns of cultivated plums.
Ann. Bot., Lond. 1955 : **19** : 467–84.
"Stamen numbers and variation were determined in cultivated varieties and seedling clones of hexaploid European plums (*P. domestica*) and in some other *Prunus* species. Stamen patterns differ between varieties, but are uniform within a clone. One genuine bud-sport had the same number as its parents, while another presumed bud-sport did not; historical evidence showed it had been sexually produced. Seedlings especially selected for vigour and fruit quality show little heterosis in stamen number compared with the parents. Self-incompatible plums have higher mean stamen numbers than those partly and wholly compatible.
"Stamen pattern is unaffected by growing conditions or by rootstocks. There is annual variation, in which varieties respond differently. Most varieties have stamen numbers between 25·1 and 30·0. A small group have over 30, being higher than either of the presumed parents (*P. spinosa* and *P. cerasifera*). Plums (hexaploids) generally have higher internal variations than cherries (diploids).
"There is no relation between stamen numbers and flowering season, stamen length, nectar yield, or style length, but purple varieties have lower numbers than other colour groups. Dessert (mainly self-incompatible) plums have higher numbers than dual purpose and cooking varieties.
"The range of variation in stamen patterns of plums agrees with earlier findings in cherries. The Prunoideae are variable in this character, in contrast to the relative constancy of Pomoideae. Stamen patterns may be helpful as as additional diagnostic character in plums."
[Authors' summary].

1737 Oldén, E. J.
Undersökningar av köldskador hos vissa plommonsorter efter artificiella frysningar vintern 1953–54. **(Investigations on frost damage in certain plum varieties after artificial freezing during the winter 1953-54).**
Sverig. pomol. Foren. Årsskr. 1954 : 36–50.
The reactions of the tissues of the shoot to injury by freezing at temperatures of −10° to −25° C in December and −20° to −35° C in the following January were studied in twigs of the diploids Beauty, Extra Early Cherry and Gloria and the hexaploids Monsieur, Early Laxton, Jefferson, Ontario, Ruth Gerstätter and Tuna. Gloria proved very resistant to damage and the other diploids susceptible, while the hexaploids were intermediate in hardiness.

1738 Renard, G. K.
(Acclimatization of the plum in the province of Omsk).
Agrobiologija (Agrobiology) 1955 : No. 4 : 238–40. [Russian].
Evidence in support of the thesis that plums grown from stones for a number of generations in Siberia will acquire an improved degree of hardiness is presented. Some productive hardy small-fruited forms, obtained by this method from an unknown Canadian variety, *Prunus ussuriensis*, and natural hybrids between these forms are described briefly.

1739 Bowman, F. T.
First release of Department of Agriculture cherries.
Agric. Gaz. NSW 1955 : **66** : p. 444.
Developed in New South Wales, the dessert cherries Rival, Reğina and Ransom have been released to fill a gap in the seasonal succession. Among their improvements is greater resistance to splitting. Rival and Ransom are open-pollinated seedlings of St. Margaret; Regina was selected from St. Margaret x Black Eagle.

1740 Takenaka, Y. & Tateoka, T.
(The origin of *Prunus yedoensis*).
Senshokutai (Chromosome)/ Kromosomo 1954 : No. 21 : 777–78. [Japanese].
Meiosis in the above species is figured and described and the authors discuss the cytological

and other reasons for and against postulating a hybrid origin for it.

1741 Crane, M. B.
Incompatibility and varietal confusion in cherries.
Sci. Hort. 1955 : **11** : 53–55.

A table showing the compatibility relationships of 81 varieties is provided and the use of incompatibility tests in distinguishing closely similar varieties is indicated.

1742 Grubb, N. H.
Cherry varieties : nomenclature and identification.
Sci. Hort. 1955 : **11** : 46–52.

After giving some instances of confused nomenclature in English varieties, the author notes characters of use in identifying varieties, such as habit of the mature tree, blossom characteristics, time of leaf fall, colour of the flesh and juice of the fruit, time of ripening, shape of the fruit and firmness of the flesh.

1743 Ivčenko, S. I.
(A sweet cherry from the Ukrainian forests).
Priroda (Nature), Leningrad 1955 : No. 9 : 99–100. [Russian].

A description is given of a wild form of *Prunus avium*, which is regarded as having value for breeding on account of its annual bearing habit, productiveness, high quality timber, hardiness, longevity, vigour and resistance to drought, pests and fungi.

1744 Fumoto, J.
(On *Prunus pauciflora* Bunge).
Saikyo Daigaku Gakujutsu Hokoku, Nogaku/Sci. Rep. Saikyo Univ., Agric. 1954 : No. 6 : 97–105. [Japanese].

It is reported that *P. pauciflora* produces small fruits on selfing but large fruits when pollinated by *P. subhirtella*.

1745 Yeager, A. F., Meader, E. M., Hough, L. F. & Bailey, C.
Meredith—a new peach for the north.
Fruit Var. hort. Dig. 1955 : **10** : p. 29.

New peach for northern areas.
Amer. Fruit Gr. 1955 : **75** : No. 11 : p. 6.

Meredith (NJ415D), developed from Slappy x Dewey, is suitable for districts at the northernmost limits of peach cultivation in the USA. It produces yellow-fleshed freestone fruits with an attractive red colour.

1746 Breviglieri, N.
Nuove varietà di pesco dall'attività genetica degli Stati Uniti. **(New peach varieties from the genetical activity of the United States).**
Ital. agric. 1955 : **92** : 628–41.

In a general outline of peach-breeding activities in the USA, reference is made to the work on breeding peaches resistant to bacterial spot and nematode, hardy varieties and early and late varieties extending the season of ripening. Brief descriptions are given of some of the varieties thought to be of possible interest for testing in Italy.

1747 Čerevatenko, A. S.
(Using Mičurin's methods in peach breeding).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1955 : No. 10 : 30–32. [Russian].

At Samarkand, Uzbekistan, a plum tree has been worked with peach buds and the resulting flowers fertilized by mixed pollen of some hardy peach varieties. Many fruits set and 35 of them ripened and bore normally developed stones. The fruit was smaller than that of the initial variety and had an appreciably higher sugar content. The first seed generation was characterized by greater vigour during the early growth phases, improved hardiness and a different shape and colour of the leaves.

1748 Zorin, F. M.
(Experience gained while conducting research on citrus fruits).
Agrobiologija (Agrobiology) 1955 : No. 4 : 200–207. [Russian].

The mandarin Saharnyĭ [Sugar] from Unshu (Satsuma) x Clementine, which is notable for a high sugar content, deserves special mention among the new hardy and early-ripening hybrids of mandarin, orange, grapefruit and lemon bred at Soči.

1749 Mamporija, F. D.
(Vegetative hybridization of citrus fruits).
Agrobiologija (Agrobiology) 1955 : No. 4 : 193–99. [Russian].

Mičurinist notions of the genetical constitution of vegetative hybrids, including what are commonly stated to be periclinal citrus chimeras, are expounded. Improved methods of grafting have given a number of distant hybrids producing edible fruits at Suhumi. The mode of segregation of these forms is described.

1750 Fukuda, J. & Koremura, M.
(Studies on the resistance of citrus varieties to *Unaspis yanonensis*. II. A comparison of the content of nutrients and organic acids in the leaves of the citrus varieties Unshu, Natsudaidai and Yuzu).
Tokai Kinki Nogyo Shikenjo Engeibu Kenkyu Hokoku/Bull. Hort. Div. Tokai-Kinki agric. Exp. Sta. 1954 : **29** : No. 10 : 150–59. [Japanese].

The Unshu (= Satsuma) mandarin is susceptible to *U. yanonensis*; on the citrus variety Natsudaidai [Summer orange] the developmental rate and reproductive capacity of the insect are lowered, while on the variety Yuzu the larvae die. These different reactions may be connected with the fact that in Natsudaidai the nitrogen content of the leaves is lower and the organic acid content much higher than in Unshu. It is suspected that the resistance of Yuzu is due to some unidentified lethal substance.
An investigation into the resistance of some 30–40 oriental citrus varieties was also made, but the only additional variety which displayed resistance was Hanayuzu [Flower Yuzu].

1751 Iwasaki, T., Ohata, T. & Nishiura, M.
(On bud pollination of the Unshu mandarin).
Tokai Kinki Nogyo Shikenjo Engeibu Kenkyu Hokoku/Bull. Hort. Div. Tokai-Kinki agric. Exp. Sta. 1954 : **29** : No. 10 : 37–41. [Japanese].

Buds and mature flowers of the Unshu (= Satsuma) and Waseunshu [Early Unshu] mandarins were pollinated with pollen from the Trovita orange. The fruit set was higher in the bud pollinations.

1752 Tozyo [Tojo], I.
(Chromosome numbers in mulberries treated with colchicine).
Nihon Sanshigaku Zasshi/Jap. J. Seric. Sci. 1954 : **23** : p. 278. [Japanese].

Tetraploid mulberry plants ($2n = 56$) have been obtained by treating the buds with 0·4% colchicine.

1753 Sobajima, Y. & Kunimura, N.
(Studies on the pawpaw. II. On fruit setting following self fertilization and investigations into pollen germination).
Saikyo Daigaku Gakujutsu Hokoku, Nogaku/Sci. Rep. Saikyo Univ., Agric. 1954 : No. 6 : 29–37. [Japanese].

Percentage fertilization in *Asimina triloba*, using self-flower pollen, was 0%; selfing with pollen from other flowers of the same plant gave a set of 22%. The cross-pollination set was 35%. Artificial self and cross pollination were both ineffective.

1754 Iikubo, S., Furuhashi, S., Hoshino, M. & Yamamoto, M.
(Studies on the vitamin C content of kaki fruits. I.).
Tokai Kinki Nogyo Shikenjo Engeibu Kenkyu Hokoku/Bull. Hort. Div. Tokai-Kinki agric. Exp. Sta. 1954 : **29** : No. 10 : 42–56. [Japanese].

The ascorbic acid contents of selfings and hybrids of 8 Japanese varieties are tabulated. General indications of the heritability of this characteristic were obtained.

1755 Carver, W. A.
The Florispan Runner peanut variety.
Circ. Fla. agric. Exp. Sta. 1953 : No. S–62 : Pp. 4.

The above variety, already referred to in *PBA*, Vol. XXIV, Abst. 3323, was developed from Ga.207–3 x (Small White Spanish x Dixie Giant). It is predominantly of the Spanish type.

1756 Gregory, W. C.
X-ray breeding of peanuts (*Arachis hypogaea* L.).
Agron. J. 1955 : **47** : 396–99.

The genetic variance in yield of dry fruits was significantly greater in both visibly injured and apparently normal X_1 progenies grown from X-irradiated seed of Virginia Bunch than in untreated material. Selection for yield was effective in the X_3. Marked variation in vegetative vigour was observed in the X_2 and X_3 progenies and some vigorous mutants which have outyielded the control have been retained for further testing.

1757 Eheart, J. F., Young, R. W. & Allison, A. H.
Variety, type, year and location effects on the chemical composition of peanuts.
Virginia J. Sci. 1955 : **6** : p. 234. (Abst.).

Variety had a greater influence on all constituents analysed than year. Locality had a greater effect on thiamin, riboflavin and hay protein contents than variety. The Spanish type had a higher protein content in the kernels than the Virginia type but lower niacin and hay protein contents. The higher the content of protein and oil in the kernel and of hay protein the greater was the varietal variability. Variety x year interaction was significant for all constituents except thiamin; variety x locality interaction was significant only in the case of

riboflavin. J–11–L and introduction 149–637 had the highest nutritive value and should prove useful in breeding.

1758 **Annual Report of the Coconut Research Board of the Coconut Research Institute for 1953** (1955) : Pp. 55.

Experiments on methods of selection have shown that it is immaterial whether seed and nuts are collected from individual high-yielding palms or from selected high-yielding blocks. By selecting seedlings for early germination, vigour, and resistance to diseases and pests, earlier flowering and markedly higher yields of nuts and copra were however obtained. F_1 intervarietal and intravarietal crosses involving Dwarf, King Coconut, San Ramon and Tall as parents are under investigation with respect to hybrid vigour.

1759 Cutter, V. M. (Jun.) & Freeman, B. **Nuclear aberrations in the syncytial endosperm of *Cocos nucifera*.** J. Elisha Mitchell sci. Soc. 1955 : **71** : 49–58.

Further observations on the aberrations and atypical divisions occurring in the free nuclei and endosperm vesicles of the syncytium and in the endosperm meristem are reported (cf. *PBA*, Vol. XXV, Abst. 2355–6). The possible physiological causes of amitosis in the free nuclei and vesicles are discussed.

1760 Scaramuzzi, F. & Cancellieri, M. B. Contributo allo studio delle razze d'olivo coltivate in Toscana. Indagini condotte in provincia di Livorno e nella media valle del Cecina. Parti III e IV. (**Contribution to the study of the varieties of olive cultivated in Tuscany. Investigations in the province of Livorno and in the central valley of the Cecina. III and IV**). Ann. Sper. agr. 1955 : **9** : No. 5 : Suppl. : i–xxvii; No. 6 : Suppl. : i–xxv.

In continuation of the research summarized in Abst. 668, detailed descriptions are given of a number of other varieties, arranged in alphabetical order. Some of them are not known outside the area in question and are described for the first time.

1761 Castorina, S. Le varietà d'olivo coltivate in Abruzzo. Parte I. (**The olive varieties cultivated in Abruzzo. I**). Ann. Sper. agr. 1955 : **9** : No. 5 : Suppl. : xxxv–lxiii.

Descriptions based on morphological, biological and agronomic characters, including resistance to diseases, pests and climatic adversities and response to manuring, are presented for eight varieties, information being given also on synonymy and area of distribution.

1762 Battaglia, E. & Breviglieri, N. Microsporogenesi regolare ed irregolare in *Olea europaea* L. (**Regular and irregular microsporogenesis in *O. europaea* L.**). Caryologia 1955 : **8** : 45–68.

Detailed observations on meiosis in *O. europaea* var. *sativa* 'Razzo' confirmed the chromosome number $2n = 46$ (cf. *PBA*, Vol. XXV, Abst. 3392). Occasional univalents were observed during metaphase I and certain phenomena associated with stickiness at anaphase; in certain cells more extreme irregularities were observed. Irregularities in the development of the microspores described include the formation of microspores with 2–8 nuclei and pentads, hexads and higher groupings. The irregularities described lend support to the previously expressed view that *O. europaea* is an allopolyploid species.

1763 Peterson, P. A. **Dual cycle of avocado flowers.** Calif. Agric. 1955 : **9** : No. 10 : 6–7, 13.

The avocado flower normally opens first in the ♀ stage (stage I); it then closes and reopens in the ♂ stage (stage II). Varieties studied in California fall into two groups with respect to the two-day cycle of opening: type A, including Rincon, Decem, MacArthur, Emerald, Hass and Anaheim; and type B, represented by such varieties as Bacon, Zutano, Fuerte, Irving and Ryan. Under glasshouse conditions, in type A stage I occurs in the morning and II in the afternoon of the following day; in type B stage I takes place in the afternoon and II in the morning of the following day. Insects are necessary for pollination between varieties of the complementary types or, when the stages overlap, for pollination among the flowers of a single tree.

1764 Zentmyer, G. A., Halma, F. F. & Wilhelm, S. **Relative susceptibility of Guatemalan and Mexican avocado rootstocks to *Verticillium* wilt.** Phytopathology 1955 : **45** : 365–66.

At Santa Barbara, Calif., Guatemalan rootstocks were appreciably more susceptible to *V. alboatrum* than Mexican varieties.

1765 VAN OOSTEN, A.
Nieuwe frambozenrassen. (**New raspberry varieties**).
Fruitteelt 1955 : **45** : p. 884.

Brief notes on varieties recently introduced into the Netherlands are given. Malling Exploit (cf. *PBA*, Vol. XX, Abst. 2148) has given exceptionally good results in Zeeland.

1766 DARROW, G. M.
The giant Colombian blackberry of Ecuador.
Fruit Var. hort. Dig. 1955 : **10** : 21–22.

It is suggested that the Colombian blackberry (*Rubus macrocarpus*) and related species may prove useful in breeding, contributing such characters as very large size of the fruits,vigour, adaptation to short photoperiods and, possibly, disease resistance.

1767 Een nieuwe braam: Columbia Giant. (**A new blackberry : Colombia Giant**).
Fruitteelt 1955 : **45** : p. 960.

A brief description in Dutch is given of the giant-fruited Colombian blackberry (cf. Abst. 1766).

1768 VOLUZNEV, A. G.
(**New varieties of soft fruits from White Russia**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1955 : No. 10 : 43–46. [Russian].

Black currant. Belorusskaja Pozdnjaja [White Russian Late] and Barhatnaja [Velvet], both obtained at Minsk by crossing Kent with a wild Siberian form, are distinguished by high yield, large sweet fruit and resistance to anthracnose.
Gooseberry. Jarovoĭ [Spring], Izjumnyĭ [Raisin] and Ščedryĭ [Generous], the first a seedling, the others intervarietal hybrids, are all characterized by *Sphaerotheca* resistance, hardiness, productiveness and large fruit. Ščedryĭ is late; the others are early.
Strawberry. Kolhoznaja [Collective Farm], Minsk, Avrora [Aurora], Ljavoniha and 1–2–127 have all the same ♀ parent, Uspeh [Success]. Marshall supplied the pollen for the first two crosses and Sharpless for two others. Variety 1–2–127 was obtained by using an unspecified pollen mixture. All these varieties are hardy, produce large fruit and outyield the standard Uspeh by a good margin.

1769 NOOY, S. H.
De teelt van rode bessen. (**The cultivation of red currants**).
Fruitteelt 1955 : **45** : 882–83.

It is suggested in the Netherlands that more attention be paid to the cultivation of red currants. Fay's Prolific, Versailles and Jonkheer van Tets (Squire of Tets) are recommended as being the varieties best adapted to local conditions.

1770 VENHORST, H. H.
De teelt van zwarte bessen. (**The cultivation of black currants**).
Fruitteelt 1955 : **45** : p. 885.

Brief descriptions are given of the varieties most commonly cultivated in the province of Limburg. In trials carried out over a five-year period at the Beesel Research Station, Roodknop [Red bud] and Goliath gave the highest yields.

1771 KRONENBERG, H. G. & DOESBURG, J. J.
Het vitamine-C-gehalte van zwarte besserassen vraagt meer aandacht! (**The vitamin C content of black-currant varieties requires more attention!**)
Fruitteelt 1955 : **45** : p. 869.

In laboratory tests conducted at Wageningen, Netherlands, considerable differences were noted between varieties in the amount of ascorbic acid present in the fruit. Baldwin, followed by Daniels September [Daniel's September] and Akkermans Bes [Akkerman's Currant], had the highest vitamin C content. Goliath was extremely poor in vitamin C.

1772 PAVLOVA, N. M.
(**Breeding black currants in the USSR**).
Agrobiologija (Agrobiology) 1955 : No. 4 : 264–71. [Russian].

Mention is made of new varieties from Leningrad, the Altaĭ territory, Novosibirsk and White Russia, all distinguished by high yield and resistance to anthracnose and some hardy and tolerant of drought. They were obtained by distant hybridization and involved a wild Siberian form or one of the selections from it in their parentage.

1773 **Goudbal.**
Fruitteelt 1955 : **45** : p. 952.

The new gooseberry variety Goudbal [Golden Ball] is described briefly. Developed at the Noordbroek Research Station, Netherlands, it produces heavy yields of large glabrous yellow berries with an attractive appearance and a good flavour suitable for preserving or as dessert. The bushes possess a rapid and vigorous growth habit.

1774 SERGEEVA, K. D.
(**A spineless gooseberry**).
Priroda (Nature), Leningrad 1955 : No. 10 : 96–98. [Russian].

A spineless form that produces large fruits and shows resistance to *Sphaerotheca* has been bred at Mičurinsk. It was obtained as follows.

First, *Grossularia robusta* was fertilized by mixed pollen from large-fruited European varieties and a spineless segregate was isolated. This was then pollinated by the mixed pollen of two subspinose American varieties.

1775 Sergeëva, K. D.
(New gooseberry varieties into production).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1955 : No. 11 : 59–61. [Russian].

Reference is made to new productive *Sphaerotheca*-resistant varieties from the Mičurin Horticultural Research Institute. They produce high quality fruit almost as large as that of Finik [Date] and Zelenyĭ Butyločnyĭ [Green Bottle]. Among them, Smena [Change], Rekord [Record], Mysovskiĭ 37 [Bay 37], Russkiĭ [Russian] and Malahit [Malachite] are notable for a high degree of resistance to *Sphaerotheca*, and Plodorodnyĭ [Productive], Russkiĭ, Izumrud [Emerald] and Pioner [Pioneer] for high yields.

1776 Simonova, M. N.
(The production of large-fruited *Sphaerotheca*-resistant varieties of gooseberry).
Agrobiologija (Agrobiology) 1955 : No. 4 : 272–75. [Russian].

Mysovskiĭ 17 [Bay 17], Smena [Change] and a number of other varieties that show resistance to *Sphaerotheca* and produce good quality fruit have been obtained at Moscow by crossing large-fruited European varieties with Haughton and other disease-resistant forms. Some are outstandingly productive. For improvement of the size of fruit, the new forms have been crossed again with European varieties. Brief descriptions of the material that is still being tested are given.

1777 Romanovskaja, O. I.
(Mičurinist horticulturists in the Latvian SSR).
Agrobiologija (Agrobiology) 1955 : No. 4 : 350–52. [Russian].

Some new gooseberry varieties from Latvia are distinguished by high yield, hardiness, resistance to *Sphaerotheca* and good quality and transportability. They were obtained by direct and reciprocal crossing of European varieties with *Sphaerotheca*-resistant forms from the USA (Haughton) or Finland (Pellervo); from crosses between European varieties and the wild species *Ribes rotundifolium, R. stenocarpum, R. gracile* and *R. cynosbati*; and by back crossing or multiple hybridization involving the above material and also a local wild black currant. Achievements in breeding improved varieties of other horticultural plants, notably peaches and vines tolerant of —28°C, are also discussed.

1778 Brightwell, W. T., Woodard, O., Darrow, G. M. & Scott, D. H.
Observations on breeding blueberries for the Southeast.
Proc. Amer. Soc. hort. Sci. 1955 : **65** : 274–78.

The rabbiteye blueberry (*Vaccinium ashei*) has so far shown most promise for cultivating in the south east of the USA. In intervarietal combinations, Black Giant and Ethel usually transmit large fruit size, whereas Myers and Walker give small-fruited progenies. Fruit colour depends upon multiple factors, dark colour being practically dominant. Some promising blue-fruited seedlings have been developed from combinations involving Ethel. Different species contain dissimilar genes for fruit colour, as shown by the high percentage of dark-fruited seedlings in the F_1 progenies of crosses of blue-fruited plants of *V. ashei* with *V. constablaei* or *V. australe*. *V. myrsinites* x *V. australe* seedlings resemble the former parent in their low growth and small leaves; back crosses to *V. australe* show considerable increase in chilling requirement. In breeding for earliness, progress has chiefly consisted in a reduction in the period of ripening, as in the *V. australe* seedling T–23–46 (Dixi x Hildebrand). Some derivatives of *V. constablaei* x *V. ashei* may be useful in further breeding. Seedlings of *V. ashei* x *V. australe* are highly vigorous; their fruits are fine flavoured but small.

1779 Gatin, Ž. I.
(Biological characteristics of sea buckthorn and the problem of introducing it into cultivation for horticulture and forest belts).
Problemy Botaniki (Problems of Botany). Akademija Nauk SSSR : 1955 : **2** : 339–74. [Russian].

High content of vitamin C and carotene, good and reliable yield of fruit, valuable medicinal properties, frost, drought and disease resistance and tolerance of unfavourable growth conditions make *Hippophae rhamnoides* an interesting object of selection and a description is given of the species and of some of the forms occurring in Siberia and other Soviet territories. The range of natural variation is wide and the possibilities for breeding are considered favourable. Thus two forms with sweet berries have been selected from among several thousand seedlings and others have been selected for large berries and high yield; one is distinguished by fruit stalks 0.6 cm. long, which facilitates

picking. With the object of extending the range of genetic variation still further it is proposed to grow mixed plantations of male and female plants belonging to a number of different types and allow them to interpollinate. Wide crossing with *Shepherdia* and with sweet-fruited forms of *Elaeagnus* is also proposed. Optimum seed germination can be obtained by stratification for about 10 days, followed by treatment for 13 days at a temperature of 0 to + 2° C. Indications are given as to the best method of raising seedlings and cuttings.

1780 Een nieuwe aardbeisoort: Holstein. (**A new strawberry variety: Holstein**). Cult. en Hand. 1955 : **21** : p. 280.

The new variety Holstein is described (cf. Abst. 688).

1781 Steyn, P. A. L.
Strawberry breeding in South Africa. Fmg. in S. Afr. 1955 : **30** : 395–400, 406.

Strawberry breeding, begun in South Africa during 1940, is surveyed. The first three commercial varieties to be developed, Bien Donné 1, 2 and 3, have recently been released (cf. *PBA*, Vol. XXV, Abst. 2845). Bien Donné 1 and 2 were derived from [3/15 (open-pollinated seedling of Tardive de Léopold) x a German variety of unknown origin] x Everbearing. Bien Donné 3 is a selection of Corvallis x Everbearing. All three varieties possess some tolerance of viruses and have so far remained free from leaf spot.

1782 Filosofova, T. P.
(**Breeding strawberries in the central provinces of the RSFSR**). Agrobiologija (Agrobiology) 1955 : No. 4 : 259–63. [Russian].

This account of breeding work at Birjulevo, Moscow province, mentions a number of new hybrids, among which the crosses of Pozdnjaja Zagorjja [Late Ultramontane] with Rozovaja [Pink] and Krasavica Zagorjja [Ultramontane Beauty] are distinguished by high yield and large fruits. Reference is made to varieties which impart earliness (Roščinskaja), fine flavour (Louise and Belyĭ Ananas [White Pineapple]), dark red colour (Caton's Wonder) and late ripening and large fruit (Late Leopoldshall) to their progenies.

1783 Henriksen, A.
Dyrkningsforsøg med nyere jordbærsorter tiltrukket ved Spangsbjerg. (**Cultivation experiments with recent strawberry varieties developed at Spangsbjerg**). Tidsskr. Planteavl 1955 : **59** : 506–29.

Details are given of the performance, quality and suitability for processing of three established varieties and five varieties recently developed at Spangsbjerg, Denmark, from a cross between an F_1 plant of Späte von Leopoldshall [Late Leopoldshall] x Deutsch Evern and the American variety Culver. Three of the Spangsbjerg strawberries proved to be of commercial value: Freja, an early variety giving good yields of medium-sized fruit; Ydun, a high-yielding mid-early type with large fruits of good flavour; and Rubin, the latest of the three, giving medium-sized juicy fruits.

1784 Kluge, K.
Untersuchungen zur Züchtung polyploider Monatserdbeeren. Das Verhalten diploider und tetraploider Formen der Sorte Rügen gegen Kahlfrost. (**Investigations on breeding polyploid everbearing strawberries. The behaviour of diploid and tetraploid forms of the variety Rügen to frost**). Arch. Gartenb. 1955 : **3** : 79–83.

Tetraploid forms of *Fragaria vesca* 'Rügen' (cf. *PBA*, Vol. XXV, Abst. 532) proved considerably more susceptible to frost and were later in flowering than diploids. They are therefore of little practical value, although crosses will be carried out between them and garden strawberries in an attempt to incorporate the everbearing habit into the latter group. Observations on the comparative frost resistance of a number of garden strawberries showed Müncheberger Frühe [Müncheberg Early] to be superior in this respect. *F. moschata* was completely undamaged by frost.

1785 Nesterov, Ja. S.
(**Proliferation of vegetative and reproductive shoots from the tissues of the strawberry fruit**). Problemy Botaniki (Problems of Botany). Akademija Nauk SSSR : 1955 : **2** : 327–28. [Russian].

Several plants of the new variety Černobrivka, when grown under humid conditions, bore fruits in which some of the tissues of the receptacle gave rise to new shoots which quickly developed flowers and set fruit; when in contact with the ground they also formed adventitious roots.

1786 Kašičkina, M. I.
(**The production of new strawberry varieties by I. V. Mičurin's method**). Zemledelie (Agriculture) 1955 : No. 9 : 41–44. [Russian].

Rubinovaja [Ruby], Russkaja [Russian], Urožaĭnaja [Productive] and Maršaljskaja

[Marshal's], all from Mičurinsk, are hardy and surpass the previous standards of the Tambov province in yield and quality. Maršaljskaja was bred from Late Leopoldshall x Maršal [Marshal]; the others from Late Leopoldshall x Louise. Material still under observation includes high-yielding hardy élites, obtained by crossing all the above varieties from Mičurinsk with others from other parts of the USSR.

1787 Schöniger, G. & Bauer, R.
Erdbeervirosen in Deutschland. 1. Befund nach Pfropfung verschiedener Sorten auf *Fragaria vesca* L. **(Strawberry viruses in Germany. 1. Result of grafting different varieties on *F. vesca* L.).**
Phytopath. Z. 1955 : **24** : 443–54.

By using a clone of *F. vesca* obtained from East Malling as an indicator, varietal differences were established in the susceptibility of a wide range of German and foreign strawberries to a number of virus diseases, including yellows, crinkled leaf, leaf chlorosis, leaf roll and stunted growth.

1788 Simmonds, N. W. & Shepherd, K.
The taxonomy and origins of the cultivated bananas.
J. Linn. Soc. 1955 : **55** : 302–12.

Taxonomic scorings based on 15 characters diagnostic for *Musa acuminata* and *M. balbisiana* were determined for a representative range of edible varieties and experimental hybrids at the Imperial College of Tropical Agriculture, Trinidad, BWI. The data support the hypothesis that the edible bananas have originated by the following steps: (1) development of parthenocarpy and sterility in 2*n* *M. acuminata*; (2) outcrossing of edible diploids of *M. acuminata* to wild *M. acuminata* and *M. balbisiana*, followed by human selection among the parthenocarpic derivatives; (3) the occurrence of triploidy as the result of restitution in *M. acuminata* and its hybrids with *M. balbisiana*, followed by haploid pollination by either species; (4) tetraploidy, most probably arising through restitution in a 3*n* type and subsequent haploid pollination; and (5) diversification by somatic mutation. No evidence that parthenocarpy also evolved in *M. balbisiana* has come to light. Only one natural tetraploid (Tiparot) is known; in view of the ready production of vigorous artificial tetraploids, the rarity of natural 4*n* forms cannot be explained at present. An undescribed species from Assam, with yellow flowers, may have made a minor contribution to the evolution of the edible bananas. Indo-Malaya is regarded as the centre of origin of these forms, Malaya probably being the primary centre. *M. paradisiaca* and *M. sapientum* were both found to be of hybrid origin.

1789 Gopalan Nayar, T. & Bakthavathsalu, C. M.
Cavendish bananas—their culture and systematic status.
Indian J. Hort. 1955 : **12** : 22–28.

This general account includes a discussion of the literature on the specific status of the Cavendish group of dwarf bananas and of the economically important bud sports originating from this group.

1790 Kryžanovskiĭ, F. D.
(Vegetative grafts in the past and present).
Priroda (Nature), Leningrad 1955 : No. 10 : 72–78. [Russian].

An historical account of grafting and of the concept of transmission of heritable characters by grafting is given from early civilizations to modern times. Mention is made of a number of vegetative hybrids between woody and herbaceous plants obtained by Cicin in the Soviet Union in recent years, notably the hybrid between *Cyphomandra* and tomato referred to in *PBA*, Vol. XXV, Absts. 2488 and 2489.
The above new form has recently been crossed with several tomato varieties and given true-breeding hybrids, characterized by productiveness, resistance to diseases, high sugar and dry matter contents and good transporting capacity. Other grafted material referred to in the article includes direct reciprocal grafts between potato and *Cyphomandra* and of *Solanum dulcamara* on *Cyphomandra*. Potato grafted on *Cyphomandra* formed tubers on the leaves and was annual in habit, but the plant from the reciprocal graft was perennial. The graft of *S. dulcamara* on *Cyphomandra*, now 5 years old, produces fruit all the year round and is evergreen.

1791 Komarova, E. S.
(Growing dessert grapes in the Ukrainian SSR).
Vinodelie Vinogradarstvo SSSR (Winemak. & Vitic. USSR) 1955 : No. 7 : 14–17. [Russian].

Data on warmth requirements of a number of vine varieties, together with notes on the colour of the grapes and the size of the bunches and grapes, are presented.

1792 Cosmo, I., Polsinelli, M. & Hugues, M.
Indagini sulla ricostituzione viticola delle Venezie ai fini dell'orientamento per i futuri impianti. Risultati della sperimentazione compiuta sui vitigni europei da vino e sui portinnesti in provincia di Gorizia a decorrere dal 1926. Primo contributo: zona collinare. **(Investigations on the viticultural reconstruction of the Venetian provinces with the object of providing guidance for future plantings. Results of experiments carried out on European wine grapes and on rootstocks in the province of Gorizia from 1926 onwards. I. Hill zone).**
Ann. Sper. agr. 1955 : **9** : 975–1021.

Trials of varieties and stocks suitable for planting in hilly regions in Gorizia were organized by the Conegliano viticultural research station. Data are provided on yield and the acidity and sugar content of the juice. The varieties that proved most generally satisfactory were Malvasia d'Istria, Pinot grigio [Grey Pinot], Ribolla gialla [Yellow Ribolla], Sauvignon, Tocai friulano [Friuli Tokai] and Traminer.

1793 Cosmo, I., Polsinelli, M. & Hugues, M.
Indagini sulla ricostituzione viticola delle Venezie ai fini dell'orientamento per i futuri impianti. Risultati della sperimentazione compiuta sui vitigni europei da vino e sui portinnesti in provincia di Gorizia a decorrere dal 1926. Secondo contributo: zona di pianura. **(Investigations on the viticultural reconstruction of the Venetian provinces with the object of providing guidance for future plantings. Results of experiments carried out on European wine grapes and on rootstocks in the province of Gorizia from 1926 onwards. II. Lowland zone).**
Ann. Sper. agr. 1955 : **9** : 1023–63.

Investigations similar to those summarized in Abst. 1792 are reported for the lowland zone of Gorizia. Malvasia istriana [Istria Malvasia] and Pinot grigio [Grey Pinot], among the white varieties, and Merlot, Barbera and Franconia among the black varieties, are recommended.

1794 Cosmo, I., Comuzzi, A. & Bordignon, S.
Indagini sulla ricostituzione viticola delle Venezie ai fini dell'orientamento per i futuri impianti. Risultati della sperimentazione compiuta sui vitigni europei da vino e sui portinnesti in provincia di Vicenza a decorrerre dal 1925. Sesto contributo. Zona di pianura: Sottozona dell'Astico. **(Investigations on the viticultural reconstruction of the Venetian provinces with the object of providing guidance for future plantings. Results of experiments carried out on European wine grapes and on rootstocks in the province of Vicenza from 1925 onwards. VI. Lowland zone: subzone of Astico).**
Ann. Sper. agr. 1955 : **9** : 1197–234.

Experiments along the lines of those summarized for Gorizia are reported (cf. Absts. 1792 and 1793). Pedevenda and Bresparola yielded best among the local white varieties but they are rather acid. Malvasia trevigiana [Treviso Malvasia] was the best introduced white variety. Sangiovese and Fresia were promising among the red varieties.

1795 Kuzjmin, A. Ja.
(A brief account of research on breeding vines at the I. V. Mičurin Central Genetical Laboratory).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) 1955 : Ser. biol. : No. 5 : 42–49. [Russian].

Some varieties and élites that have been bred at Mičurinsk and are distinguished by a short growth period, high yield, hardiness and good grape quality are described. Most were obtained by crossing Mičurin varieties with either Mičurin varieties or with early-ripening European varieties such as Malengr Ranniĭ [Early Malingre].

1796 Negrulj, A. M.
(Mičurin's theory in viticulture).
Vinodelie Vinogradarstvo SSSR (Winemak. & Vitic. USSR) 1955 : No. 7 : 1–6. [Russian]'

This account of breeding work on vines at various Soviet institutes mentions a number of varieties bred in recent years. These are mainly distinguished by hardiness and short growth periods and are adapted to cultivation in the central and northern RSFSR, Siberia and the Far Eastern Territories.

1797 Negrulj, A. M. & Žuravelj, M. S.
(I. V. Mičurin and vine breeding).
Agrobiologija (Agrobiology) 1955 : No. 4 : 248–58. [Russian].

A number of new vine varieties bred at Taškent, Uzbekistan, are described. Most of them are high quality dessert varieties with light or dark coloured grapes and Oktjabrjskiĭ [October] (Nimrang x Karmannyĭ [Pocket]) and Pozdniĭ VIRa [Late Institute of Plant Industry]

(Nimrang x Dodreljabi) are characterized by good transporting capacity. Muskat VIRa [Institute of Plant Industry Muscat] (Belyĭ Muskat [White Muscat] x Hamburg Muscat) and Tarnau (Nimrang x Kišmiš Černyĭ [Black Sultana] are productive wine varieties, the former notable for muscat flavour and the latter for seedless grapes.

1798 Zabala, S.
Comportamiento en Villa Alberdi (Tucumán) de tres variedades de vides, del grupo de los híbridos productores directos. [**Behaviour in Villa Alberdi (Tucumán) of three vine varieties of the direct-producer hybrid group**].
Idia 1955 : No. 88 : 12–13.

The hybrid Baco 2–16 is recommended on account of its early bearing, vigour and resistance to *Sphaceloma ampelinum* and *Plasmopara viticola*; its fruit is relatively free from wild flavour and is suitable for dessert or for wine making.

1799 Christ, E. G.
More than 300 varieties in grape research plots.
NJ Agric. 1955 : **37** : No. 4 : 13–15.

Promising hybrids combining the better qualities of *Vitis vinifera* and American species are being grown at the NJ Agricultural Experiment Station and include the yellow-fruited Seibel 9110, Himrod, Romulus and NY15302, the black grape Schuyler and the reddish purple Canada 29186 and USDA4032–1, all dessert varieties.

1800 Ribéreau-Gayon, P., Sudraud, P. & Durquety, P.-M.
Relations entre génétique et nature chimique des pigments anthocyaniques de la baie dans le genre *Vitis*. (**Relationships between the genetics and the chemical composition of the anthocyanin pigments of the berry in the genus *Vitis***).
Rev. gén. Bot. 1955 : **62** : 667–74.

Differences between species in the chemical composition of the anthocyanins were determined by means of the combined chromatographic and biochemical method described in *PBA*, Vol. XXIV, Abst. 2456. All the 30 French varieties of *V. vinifera* studied were identical in the chemical composition of their anthocyanins; species of American origin were divided into two distinct groups, the one comprising forms originating in the Mississippi basin, the other consisting of species from the Allegheny region. Chemical composition was determined in each case by a single gene, designated *F* in the French varieties, *H* in species from Mississippi and *X* in vines originating in the Allegheny region. In interspecific hybrids, these genes formed an epistatic series in the order $H > X > F$. Hybrids between *V. riparia* and *V. labrusca* had the genetic constitution *HX*, those between *V. riparia* and *V. rupestris* the constitution *HH* and crosses between *V. riparia* and *V. vinifera* and between *V. rupestris* and *V. vinifera* the constitution *HF*. The crosses *V. aestivalis* x *V. vinifera* and *V. labrusca* x *V. vinifera* had the constitution *XF*. Tabulated data are provided on the putative genetic constitution, as regards the chemical composition of the anthocyanins, of a wide range of hybrids between French and American varieties.

1801 Huglin, P.
Étude sur la morphologie, la phénologie et la productivité des principaux cépages de *V. vinifera* L. cultivés en Alsace. (**Study of the morphology, phenology and productiveness of the principal varieties of *V. vinifera* L. grown in Alsace**).
Ann. Inst. nat. Rech. agron., Paris 1955 : Sér. B : **5** : 5–51.

Detailed descriptions, illustrated by photographs, are given of the leaves, grapes and pips of the 10 varieties of vine most commonly cultivated in Alsace. The characteristics that permit the different varieties to be readily distinguished from each other are especially emphasized and an attempt is made to classify them into groups according to the type of pubescence found on the buds and the shape of the leaf base of the adult leaves. Data on the time at which the leaves emerge, time of flowering, period at which the grapes begin to ripen and time at which they are fully ripe are also given, together with information on varietal differences in yield and sugar and acid contents. Chasselas and Sylvaner are the varieties most widely favoured by Alsatian growers and, together with Auxerrois, Pinot blanc [White Pinot] and Riesling, give the highest yields.

1802 Potapenko, Ja. I.
(**Improving the biological adaptability and productiveness of new varieties**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1955 : No. 10 : 69–73. [Russian].

The vines Fioletovyĭ Ranniĭ [Early Mauve], Muskat Ranniĭ 2 [Early Muscat 2], Dekorativnyĭ [Ornamental] and Severnyĭ Saperavi [Northern

Saperavi], all from the USSR Institute of Viticulture and Wine Making, are described. They are distinguished by high yield and hardiness and especially by a long dormancy period which enables them to escape frost injury. Fioletovyĭ Rannii and Muskat Rannii 2 show resistance to mildew.

1803 Zuluaga, P. A. & Zuluaga, E.
Segunda contribución al estudio de la biología floral de la vid en Mendoza. (**Second contribution to the floral biology of the vine in Mendoza**).
Bol. téc. Fac. Cienc. agrar. Univ. Cuyo 1954 : Nos. 7 and 8 : 3–47.

A large number of vines were classified into the six floral types previously defined (cf. *PBA*, Vol. XXII, Abst. 3003) and observations were made on the fruit set on selfing, the form of the pollen grains and their germination in an artificial medium; a list of varieties is given in which the pollen failed to germinate at all. A correlation of $r = 0{\cdot}630$ was observed between length of stamen and pollen fertility. Variations in fertility were observed between plants of a single variety and selection of the most fertile individuals has led to improvements in set in the varieties Cereza [Cherry], Criolla Grande [Large Local], Moscatel de Alexandria [Alexandria Muscat] and Moscatel rosado [Pink Muscat], all of which are popular varieties in the Mendoza zone of Argentina on account of their quality. The selections are being multiplied clonally.

1804 Crescimanno, F. G.
Risultati di due anni di prove sulla stimolazione rizogena in talee di vitigni porta innesti. (**The results of two years' tests on stimulation of rooting in cuttings of vine stocks**).
Nuovo G. bot. ital. 1954 : **61** : 357–77.

Data on the rooting capacities of cuttings of a series of Sicilian varieties are provided. Various treatments were investigated, also the effect of Seradix 1, 2 and 3 and of vitamin B_1 on root formation.

1805 Baranov, P. A., Negrulj, A. M. & Frolova, K. I.
(**The wild vine of Central Asia**).
Problemy Botaniki (Problems of Botany). Akademija Nauk SSSR : 1955 : **2** : 74–112. [Russian].

A description is given of the conditions under which the wild vines grow in the Soviet territories of Central Asia and of the types found. There are no indications that they are ever subjected to frost but some of them seem to withstand drought in summer and might provide breeding material of interest in this respect.

The heterogeneous nature of the populations indicates that they are reproduced from seed and the vines of one locality are quite often different in type from those of another; some show more resemblance to the cultivated vines, others more to *Vitis vinifera* ssp. *sylvestris*. When grown under cultivation the wild vines retained their general characteristics, only slightly enlarging the size of the vegetative organs and of the bunches; the sugar content of the grapes increased only slightly but the acidity diminished.

The greatest diversity of forms among both wild and cultivated vines was found in Kopet-Dag; some of the cultivated varieties are wild forms that have only recently been taken into cultivation. Among the wild population there are forms not found in other areas, such as pure male vines and forms with large elongate grapes and long bunches. Some of these wild forms are considered to be true representatives of the wild grape, *V. vinifera* ssp. *sylvestris*, while others show clear affinities with the glabrous-leaved wine varieties of the Caspian group, classed as *V. vinifera* ssp. *sativa* convar. *orientalis*; these are regarded as cultivated vines that have reverted to the wild. There are also a great number of intermediate forms, which have obviously arisen by hybridization between the true wild vine and the reverted forms. The populations of the other areas studied consist only of reverted forms, those of the western Tien Shan and Tadžik areas from the wine grapes of the Caucasus (convar. *pontica*) and the Caspian shores (convar. *orientalis* var. *caspica*) and those of Darvaz from table grapes of the Husain type (convar. *antasiaticae*).

Very few of the wild forms observed are deemed worthy of attention as sources of breeding material for dessert grapes or raisins but a few selections of promising wine grapes, with a higher acidity than the majority of the insipid local forms, have been made.

1806 Kuzjmin, A. Ja. & Filippenko, I. M.
(**New varieties and élite seedlings of vine**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1955 : No. 10 : 74–76. [Russian].

Nagrada [Award], from Russkiĭ Konkord [Russian Concord] x Ezandari Belyĭ [White Ezandari] and Tambovskiĭ Rozovyĭ [Pink Tambov], from Sejanec Malengra [Malingre Seedling] x 135, and several other hybrids, which are still under trial at Mičurinsk, are

described. Most of them surpass their parents in yield, hardiness and quality and equal them in resistance to mildew.

1807 Stover, L. H.
The Lake Emerald grape.
Circ. Univ. Fla. agric. Exp. Sta. 1954 : No. S–68 : Pp. 12.

The table grape Lake Emerald, developed from a cross of the native white type Pixiola with Golden Muscat and recommended primarily for domestic gardens, is resistant to degeneration probably caused by Pierce's disease.

FORESTRY

1808 Eifler, I.
Künstliche Polyploidie-Erzeugung bei *Picea abies* und *Betula verrucosa*. (**Artificial induction of polyploidy in *P. abies* and *B. verrucosa***).
Z. Forstgen. Forstpflanzenz. 1955 : **4** : 162–66.

Tetraploid forms of *P. abies* and *B. verrucosa* were obtained by treating the seeds of élite trees with 0·25 and 0·2% colchicine solutions respectively. The young tetraploid seedlings of *P. abies* were characterized by a slow rate of growth and short, dark-green, pointed needles with a bluish tinge. Tetraploid plants of *B. verrucosa* had thick, deeply-serrate leaves with a pronounced indentation at the base. They too grew more slowly than the corresponding diploid form. The polyploid forms of both species had considerably larger stomata than the diploids. It is intended to cross the polyploid forms of *P. abies* and *B. verrucosa* with diploids in the hope of obtaining vigorous triploid trees.

1809 Wright, J. W.
Genetic implications of long-distance pollen transport.
Z. Forstgen. Forstpflanzenz. 1955 : **4** : 126–28.

The theory that continuous genetic differentiation can arise in a forest-tree population through the effect of distance is developed mathematically and it is concluded that pollen transport over distances of more than 10 miles is ineffective in preventing such differentiation occurring. Pollen grains from distant localities would appear to give rise to local x distant hybrids only in a relatively small number of cases; the few hybrids that arose in this manner would tend to back cross with the local form and, in most cases, selection pressure would bear more heavily upon them than upon neighbouring trees.

1810 Scamoni, A.
Über den gegenwärtigen Stand unseres Wissens vom Pollenflug der Waldbäume. (**On the present state of our knowledge of pollen dispersal in forest trees**).
Z. Forstgen. Forstpflanzenz. 1955 : **4** : 145–49.

The literature on the subject is reviewed with special reference to the danger of the contamination of seed nurseries by foreign pollen.

1811 Koltay, G. & Kopecky, F.
Őshonos nyáraink leromlott öröklöttségének megjavítása. (**Improvement of the deteriorated heredity of indigenous poplars**).
Erdész. Kutat. 1954 : **2** : No. 2 : 65–86.

Six Hungarian stands of *Populus canescens*, one at Bugac and the others along the flood plain of the Danube, have been detected in which the heartwood is white. A highly variable progeny has been obtained by crossing trees of *P. canescens* from Bugac and Ráckeve with *P. bolleana*, the latter a drought-resistant species with a straight bole. Hybrids have also been reared from (1) intercrosses between the white-wooded grey poplars at Bugac, (2) *P. alba* x *P. bolleana* and (3) *P. angulata* x *P. bolleana*. The F_1 trees of the second set of crosses grew very vigorously.

1812 Rol, R.
Les Faux de Verzy. (**The Verzy Sports**).
Bull. Soc. bot. Fr. 1955 : **102** : 81e Sess. extraord. : 25–29.

A description is given of a stand of contorted beech trees, a mutant type that has persisted for several centuries in a small wood near Verzy, northern France. It is characterized by the twisted growth of the main stem and branches.

Report on forest research by the Forestry Commission for the year ending March, 1954 (1955) : Pp. 177.

1813 *Matthews, J. D. Forest genetics. (pp. 27–29).*

Selection of plus trees of pine, larch and beech for breeding continued.

A seed orchard for the production of F_1 hybrids between European and Japanese larches was established in Dumfriesshire, Scotland. Inbreds of European larch are to be developed for crossing with inbreds of Japanese larch.

Seed of *Pinus banksiana* ♀ x *P. contorta* ♂ is expected to be available shortly.

Promising strains of Douglas fir have been found in Scottish plantations.

1814 *Carlisle, A. Variation in the native Scots pine of Scotland.* (*pp. 55–56*).
The main results of a survey of morphological variants are summarized.

1815 *Laing, E. V. Morphological variations in tree species.* (*pp. 56–57*).
Differences between the cotyledons of Japanese and European larch were determined with a view to estimating the percentage of hybrid seed in samples collected from mother trees of Japanese larch. Further work was carried out on dissimilarities between *P. contorta* and *P. murrayana*. In Douglas fir, the occurrence of stone cells in the leaf mesophyll is apparently a reliable character for distinguishing intermediate forms.

1816 *Matthews, J. D. Production of seed by forest trees in Britain.* (*pp. 64–78*).
A general account of some of the factors affecting flowering and fruiting is followed by a summary of data on seed production by the more important species in Britain; most of the observations were made during the search for plus trees.

1817 *Buszewicz, G., Edwards, M. V. & Matthews, J. D. East Scotland Scots pine seedling provenance trial.* (*pp. 78–83*).
In a provenance trial of seedlings raised from seed collected in eastern Scotland, weight per 1000 seeds was positively correlated with the mean height of one-year-old seedlings; altitude was negatively correlated with seed weight and positively with percentage of underdeveloped embryos.

1818 *Edwards, M. V. Norway spruce provenance experiments.* (*pp. 114–26*).
In trials in the Kielder and Newcastleton forests on the Scottish border, Norway spruce (*Picea abies*) from south-eastern Europe has grown the most vigorously, trees of Finnish, Norwegian and Swedish provenances giving the least successful performance.

1819 Gaussen, H.
Classification des pins diplostélés. (**Classification of diplostelic pines**).
CR Acad. Sci., Paris 1955 : **241** : 1366–69.
The author gives a brief account of recent work on the classification of diplostelic pines at the Institute of Forest Genetics, California. The affinity between different species and the extent to which they hybridize are illustrated by means of diagrams.

1820 Van Campo, M.
Quelques pollens d'hybrides d'Abiétacées. (**Some pollen grains of hybrids of the Abietaceae**).
Z. Forstgen. Forstpflanzenz. 1955 : **4** : 123–26.
The results of phylogenetic and taxonomic studies carried out at the Natural History Museum, Paris, are presented. Pollen grains of the artificial hybrid x *Abies vilmorini*, obtained at the Vilmorin arboretum from a cross between *A. cephalonica* and *A. pinsapo*, varied considerably in the size of their air sacs. Examination of the pollen grains of *Tsuga longibracteata*, *T. crassifolia* and *T. hookeriana* suggested that these forms are also interspecific hybrids and it is proposed that they be designated x *Tsugo-Keteleeria longibracteata*, x *Tsugo-Piceo-Picea crassifolia* and x *Tsugo-Picea hookeriana* respectively.

1821 Wettstein, W. & Niklas, L.
Vergleichende Pollenuntersuchungen an verschiedenen Lärchenrassen. (**Comparative investigations of the pollen of different larch races**).
Öst. bot. Z. 1955 : **102** : 520–23.
This article constitutes a preliminary account of investigations in progress at the Mariabrunn Research Station, Austria, on differences in pollen size between larch trees from the Austrian Alps, the Sudetenland and southern Poland.

1822 Hall, M. T.
Comparison of juniper populations on an Ozark glade and Old Fields.
Ann. Mo. bot. Gdn. 1955 : **42** : 171–94.
The differences between three populations representing the Ozark and Northern races of *Juniperus virginiana*, and growing in the Missouri Botanical Garden Arboretum less than a mile apart, were closely related to disparities in their native habitats (cf. *PBA*, Vol. XXIII, Abst. 1505). Possible causes of the present rapid evolution within *Juniperus* in eastern North America are discussed.

1823 Schmidt, V. W. & Stern, K.
Methodik und Ergebnis eines Wachstumsvergleichs an vier zwanzigjährigen Kiefernversuchsflächen. (**Procedure and result of a comparison of growth in four twenty-year old experimental areas of pine**).
Z. Forstgen. Forstpflanzenz. 1955 : **4** : 38–58.
A method of comparing the growth rhythms of pines of different provenance races is described.

It consists in calculating Backman growth functions,

$$y = c_0 \int_{-\infty}^{x_i} e^{-x_i^2} \, . \, dx,$$

for each provenance type and expressing these as ratios of the values obtained for a standard type; x_1 is the biological time of each type and is equal to $c_1 \log t_i + c_2$; t represents time in years, c_0, c_1 and c_2 are constants.
The method is exemplified by an analysis of trials of 17 provenance races at 4 German localities, using the race from Eberswalde as the standard. The method was able to show a general over-all difference in the growth rhythms of races from warm and from cold zones, also differences between races with a similar climatic adaptation. Growth rhythm was sometimes affected markedly by the location of the trial ground, but seasonal climatic variation had comparatively little effect.

1824 Mátyás, V.
Az erdei- és feketefenyőmag ezermagsúly vizsgálatának eredményei. (**Results of examinations of the thousand-seed weight of *Pinus sylvestris* and *P. nigra*).**
Erdész. Kutat. 1954 : No. 3 : 83–104.
Hungarian ecotypes of both species tend to differ in their 1000-seed weights. Ecotypes from hungry soils generally have heavier seeds than those from fertile land.

1825 Nienstaedt, H. & Kriebel, H. B.
Controlled pollination of eastern hemlock.
For. Sci. 1955 : **1** : 115–20.
Of the nine types of bag used in controlled pollination of *Tsuga canadensis* at the Connecticut Agricultural Experiment Station, white cloth bags were the most satisfactory, bags of parchment ranking second and kraft third.

1826 Bingham, R. T. & Squillace, A. E.
Self-compatibility and effects of self-fertility in western white pine.
For. Sci. 1955 : **1** : 121–29.
Compared with cross pollination, self pollination of *Pinus monticola* had no influence upon cone yield but caused marked reduction in yield of sound seed, germinative capacity and seedling height, and a 275% increase in the amount of hollow seed. The production of self-pollinated seedlings was 51·4% that of cross-pollinated. Tree-to-tree variation in yield of selfed seedlings was apparently due to differences in both self compatibility and self fertility. Some trees displayed wide seasonal differences in yield of seedlings when selfed. The bearing of these results upon breeding and the production of certified seed from clones is discussed.

1827 Ehrenberg, C., Gustafsson, Å., Plym Forshell, C. & Simak, M.
Seed quality and the principles of forest genetics.
Hereditas, Lund 1955 : **41** : 291–366.
By means of X-ray photography seeds of forest trees can be classified according to the development of the embryo and endosperm; application of the method to *Pinus*, *Picea* and *Alnus* is described.
Environmental conditions have considerable influence on seed quality, as shown by the production of poor seed by *Pinus sylvestris* at high latitudes and altitudes. Experiments on this species have indicated that type of pollination also affects seed quality, and that so-called minus trees bear more and larger cones and correspondingly heavier seed than plus and normal trees in the same stand.
Analysis of an Arctic population of *Pinus sylvestris* revealed genetically determined differences in environmental adaptation with regard to embryo and endosperm development. It is suggested that new ecotypes for the Arctic could be synthesized by intercrossing genotypes selected for both growth properties and seed quality.
Polyembryony has been detected in *Alnus* by X-ray photography; its frequency appeared to be related to genotype.
Seeds of mother trees and grafts of *Pinus sylvestris* were compared. The "characteristic" properties, such as shape, surface structure and colour, were remarkably constant within individual genotypes but the "casual" properties, such as size and weight, differed considerably in mother tree and grafts and also from year to year.
The influence of seed quality on germination and plant vigour was studied in pine and spruce. It is concluded that X-ray photography could partially replace ordinary methods of seed testing.
The growth characteristics of progenies of plus and minus trees of pine subjected to open, cross and self pollination were investigated. Although the greater cone size of minus trees resulted in higher seed weight and thus in increased juvenile growth, the progenies were often characterized by stunted growth, even when only three years old. Minus trees may therefore possess incompletely recessive or incompletely

dominant factors for growth. Comparison of northern and southern types also indicated the primary importance of genotype in determining growth.
The superiority of *Picea abies* of foreign provenance over native Swedish populations is attributed not only to hereditary superiority in growth but also to the increase in juvenile growth resulting from greater size of the seeds borne by the larger cones.
Types of seed plantations are among the topics discussed in the final section.

1828 Mergen, F., Hoekstra, P. E. & Echols, R. M.
Genetic control of oleoresin yield and viscosity in slash pine.
For. Sci. 1955 : **1** : 19–30.
The inheritance of the yield and viscosity of oleoresin in *Pinus elliottii* was studied by controlled pollination studies on selected trees throughout the Naval Stores Belt of the USA. Both characteristics are heritable, especially viscosity, and steps are now being taken to improve the yield of oleoresin by establishing nurseries of superior genotypes.

1829 Schmitt, R.
Über die Verbreitung des Pollens von *Pinus silvestris* L. (**On pollen dispersal in *P. sylvestris* L.**).
Z. Forstgen. Forstpflanzenz. 1955 : **4** : 142–45.
The results are given of preliminary studies at the Hessian Forestry Experiment Station, Giessen, on the range of pollen dispersal in *P. sylvestris*. A minimum isolation distance of 1000 m. is recommended for the production of pine seed.

1830 Andersson, E.
Pollenverbreitung und Abstandsisolierung von Forstsamenplantagen. (**Pollen dispersal and the isolation of forest-tree seed nurseries**).
Z. Forstgen. Forstpflanzenz. 1955 : **4** : 150–52.
The results of experiments carried out at different localities in north and south Sweden are reported. It was shown that no areas of Sweden are free of pine and spruce pollen during the flowering season and that hybridization as the result of foreign pollination amounts to between 7 and 25% in most seed nurseries. On the basis of these findings it is recommended that seed nurseries be isolated as much as possible and should also be increased in size.

1831 Anderson, R. L. & French, D. W.
Evidence of races of *Cronartium ribicola* on Ribes.
For. Sci. 1955 : **1** : 38–39.
Ecidiospore collections from *Pinus strobus* and *P. monticola* in the USA caused a chlorotic reaction on a clonal line of *R. hirtellum*; ecidiospores from *P. lambertiana* caused a necrotic response.

1832 Holst, M. J.
Breeding for weevil resistance in Norway spruce.
Z. Forstgen. Forstpflanzenz. 1955 : **4** : 33–37.
Damage caused to North American plantations of *Picea abies* by the white pine weevil and the danger of this pest spreading to Europe are discussed. Studies at the Petawawa Forest Experiment Station, Canada, suggest that there is a positive correlation between susceptibility and the length and diameter of the leader. In addition, genotypes possessing slender trunks and branches and narrow crowns are more resistant than genotypes with thick trunks and branches and broad crowns. Although it may be possible to improve resistance by selection, the writer considers that interspecific hybridization with *P. glauca* and *P. pungens* offers the best possibilities. Attempts at the Petawawa station to cross *P. abies* with *P. glauca* having failed, it is suggested that it may be possible to transfer genes for resistance by employing *P. sitchensis* or *P. kojamai* as a crossing bridge.

VEGETABLES

Tuinbouwdagen 1955. Tekst van de voordrachten gehouden te Wageningen 14–16 April. (**Horticultural Meeting 1955. Text of lectures delivered at Wageningen 14-16 April**).
Meded. Dir. Tuinb. 1955 : **18** : 515–774.
The following papers are of interest to plant breeders:—

1833 *Dorst, J. C. Plantenveredeling en genetica in Rusland. (Plant breeding and genetics in Russia). (pp. 693–704).*
The speaker reported on impressions gained during a tour of Russian plant breeding stations in August 1954. In considering the Soviet approach to plant breeding and genetics, special reference is made to the teachings of Mičurin and Lysenko, the manner in which Darwin's writings have been interpreted in the Soviet Union, interspecific and intergeneric hybridization,

vegetative hybridization, and training and the inheritance of acquired characters.

1834 *Banga, O. De ontwikkeling van de rassensituatie bij groentegewassen.* (*The development of the varietal situation in vegetables*). (*pp. 730–40*).

The economics of vegetable growing in the Netherlands for home consumption and export are discussed and, in this context, mention is made of the principal varieties of tomato, lettuce, cucumber, cauliflower, beans, peas, radish, onion and asparagus at present cultivated and of changes that have occurred in recent years in the choice of the most popular varieties.

1835 *Elzenga, G. Veredelingsproblemen bij* Angelica archangelica. (*Breeding problems in* A. archangelica). (*pp. 748–52*).

Selection of angelica for higher oil content of the roots is discussed. It was shown that the total oil content of the entire root system may be accurately assessed by determining the amount of oil present in the lateral roots (cf. *PBA*, Vol. XXV, Abst. 448).

1836 *Van Soest, W. De teelt van sla in het winterhalfjaar.* (*The cultivation of lettuce in the winter season*). (*pp. 753–60*).

Mention is made of varieties suitable for cultivation under glass in the Netherlands. They include Regina (formerly Kerklaan), Proeftuins Blackpool (a selection from the English variety Blackpool) and Interrex (formerly Meeuwisse). The first two of these varieties have dark-green leaves; Interrex has light-green leaves. Tabular data on disease resistance, shape of the head and photoperiodic requirements are provided for each variety.

1837 *De Bruyne, A. S. Tendenzen in de ontwikkeling van het Nederlandse fruitsortiment.* (*Trends in the development of the Netherlands fruit collection*). (*pp. 761–74*).

The economic aspect of apple cultivation for export is discussed with reference to the choice of the most suitable varieties for this purpose. In recent years Cox's Orange Pippin and Golden Delicious have supplanted Jonathan and Schone van Boskoop [Boskoop Beauty] as the two varieties most widely grown in the Netherlands. Both Cox's Orange Pippin and Golden Delicious, however, possess certain disadvantages and new introductions from North America and England are being tested at the Elst Research Station with a view to finding high-yielding varieties bearing fruit of good keeping quality and suitable for wide-scale cultivation in the Netherlands. In addition, breeding for resistance to scab, mildew, canker and woolly aphid is being undertaken at Elst and Cox's Orange Pippin, Winston and Lady have been treated with colchicine to obtain tetraploid forms of these varieties.

1838 **New vegetable varieties. List II.** Proc. Amer. Soc. hort. Sci. 1955 : **65** : 493–511.

Further varieties of beans, cabbage, carrot and other vegetables introduced by official institutions in the USA and Canada during 1936–1954 are listed (cf. Abst. 726).

1839 Realizóse en el Instituto de Fitotecnia la 2a reunión técnica de horticultura. (**The 2nd meeting on technical horticulture took place at the Plant Breeding Institute**).
Idia 1955 : No. 89 : 1–3.

A summary of the proceedings of the meeting, which took place at the plant breeding institute at Castelar in Argentina from 18 to 20 April, 1955, is presented and contains the following items of interest to plant breeders. In the section on varieties reference was made to the local tomato Platense which is grown in preference to most imported varieties because of its tolerance of unfavourable conditions but needs improving in respect of uniformity; selection to this end has already been started. Selection in carrots has led to a reduction in bolting. Points debated in the discussion included the degree of cross pollination in lettuce.

The discussion in the section on plant breeding stressed the need for breeders on the one hand and consumers and growers on the other to understand one another's problems; also the need for the foundation of faculties of plant breeding as well as genetics in the universities and for selection work designed to increase the varietal purity of local strains of vegetables. Reference was made to work in progress on breeding tomatoes with increased content of vitamin C, sweet maize with greater sugar content, cabbages free from bolting, improved canning and fresh peas and synthetic varieties of onion.

1840 Ovečka, V.
Nově vyšlechtěné odrůdy okurek a poru. (**New selected cucumber and leek varieties**).
Za socialist. Zeměd. 1955 : **5** : 1162–67.

The new leek variety Dětenický from Valtice is characterized by high yield and good overwintering ability. The cucumber Znoemské nakládačky [Znoemské Pickling] has a growth period of 68 days and outyields the standard by 11·2%.

1841 Abdur Rashid Khan & Aslam Ghayur
Vegetable growing in the Punjab (Pakistan).
Agriculture, Pakistan 1954 : **5** : 11–19.
The article includes an account of the development of improved varieties of many kinds of vegetables by selection of local and introduced types and by hybridization between these types at the different stations in the mountains and plains.

1842 Daskaloff, C.
Die Heterosis und ihre Ausnutzung im Gemüsebau. **(Heterosis and its exploitation in vegetable growing).**
Dtsch. Landw., Berl. 1955 : **6** : 384–89.
Work at the Marica Research Institute, Bulgaria, on the production of F_1 commercial hybrids is reviewed. Especially favourable results were obtained from crosses between inbred lines of the tomato varieties Sarja [Dawn] and Comet, the egg plants Delikatess [Delicacy] and No.12 and the paprika varieties Siwrija 600 and Kalinkov 805.

1843 Goodman, O.
Further investigation of some of the factors affecting quality and yield in carrot crops.
J. Dep. Agric. Éire 1953–54 : **50** : 104–28.
Significant differences in yield and amount of splitting of roots were found among the six bunching varieties and six main-crop varieties tested, root splitting being most frequent in the stump-rooted varieties.

1844 Atkin, J. D. & Sayre, C. B.
What makes bitter carrots "bitter"?
Fm. Res. 1955 : **21** : No. 4 : p. 15.
It is mentioned that no significant differences in bitterness of stored carrots have been found between varieties and strains. The considerable variation of roots within a line suggests, however, the possibility of selecting for freedom from this defect, but at present alteration of storage conditions and addition of minor elements to the soil appear to offer the best solutions to the problem.

1845 Tomar, M. S. & Khanna, A. N.
Colchicine-induced polyploidy in radish.
Indian J. Hort. 1955 : **12** : 6–14.
Tetraploids induced by colchicine treatment of germinating seeds flowered later and for a longer period than the diploids and had larger stomatal and epidermal cells. Pollen sterility in diploids obtained from treated seeds was high; in such plants rings were formed at diakinesis. Tetraploid pollen grains were larger than normal diploid and were 32·3–60% sterile. The considerable variation in pollen size of the $4n$ plants was probably attributable to the unequal distribution of the chromosomes observed at anaphase I.

1846 Subramanyam, K. N.
Cytology of a sterile radish plant.
Madras agric. J. 1955 : **42** : 233–34.
A plant ($n = 9$) setting no siliquas showed considerable irregularity in the distribution of the chromosomes to the poles at anaphase I and II. Each pollen mother cell gave rise to 2–6 cells. Pollen fertility was estimated as 8·6% but the pollen did not function on normal plants.

1847 Singh, H. B. & Bhagchandani, P. M.
Onions that yield well and store well.
Indian Fmg. 1955 : **5** : No. 8 : 24–26.
Pusa Red, a selection of local red onion, and the American variety Early Grano have shown promise under conditions at Delhi.

1848 Perry, B. A. & Jones, H. A.
And now it's the Early Crystal.
Sth. Seedsman 1955 : **18** : No. 9 : 30–33.
Originally selected at the George Lang Farm, Laredo, Tex., the onion Early Crystal 281 is to be released for the southern region of the USA. Its parentage includes Crystal Wax and Excel. It is resistant to pink root and less subject to splitting and bolting than previous introductions of the Crystal Wax type. It is ready for harvesting 10–14 days earlier than Eclipse (cf. *PBA*, Vol. XXV, Abst. 3462).

1849 Watanabe, S.
(Ecological studies on cabbage varieties).
Nogyo Gijutsu Kenyusho Hokoku/Bull. Nat. Inst. agric. Sci. 1954 : Ser. E. : No. 3 : 1–111. [Japanese].
Several hundred Japanese and American varieties were classified into 27 groups on the basis of morphological and developmental characteristics. The best varieties for spring sowing in the milder regions of Japan belong to the dark-leaved section of the Succession group. For summer sowing, the best-adapted varieties were from the Early Summer, Danish Ballhead, Late Flat Dutch and Hakodateao groups. The varieties most suitable for autumn sowing came from the Nakanowase [Nakano Early], Toyodawase [Toyoda Early], Succession and Slow Bolting Flat Dutch groups.
The author has bred three winter-hardy varieties for summer sowing: Shoto [Early Winter], Chuto [Midwinter] and Banto [Late Winter]; the first two varieties were segregates from Takashi x

Late Flat Dutch, the third was a selection of Takashi. The varieties mature in the order quoted.

1850 FINCH, C. G.
Autumn cauliflower investigations, 1953.
J. nat. Inst. agric. Bot. 1955 : **7** : 355–64.

As a result of investigations carried out at several centres in England, 58 varieties could be arranged in 12 groups according to leaf type and in 9 on the basis of date of maturity.

1851 HORNE, F. R.
Winter cauliflower: history and breeding in the South West.
Sci. Hort. 1955 : **11** : 128–39.

Descriptions are given of the Italian, Angers, Cornish, Northern and Roscoff types and breeding at Seale-Hayne College, Devonshire, England, since 1928 is reviewed, particular attention being paid to the development of improved strains and hybrids of Roscoff.

1852 GILBERT, J. C.
Pua Kea—cauliflower for low elevations.
Hawaii Fm. Sci. 1955 : **4** : No. 2 : 1, 5, 8.

Observations on breeding cauliflowers adapted to hot weather conditions in Hawaii are presented. Selections varied much in fertility but inbred, self-fertile lines have been developed. Inbreeding and selection have been effective in eliminating undesirable characters such as a tendency towards premature curd formation and in improving uniformity, vigour, time of maturity and curd characteristics. The heat-tolerant variety Pua Kea was recently released (cf. *PBA*, Vol. XXIV, Abst. 1493).

1853 SHERRARD, G. O.
The breeding of Brussels sprouts at the Albert College.
Sci. Hort. 1955 : **11** : 124–27.

Breeding at the Albert Agricultural College, Dublin, since 1924 is surveyed, particular reference being made to the development of Billiard Ball and the complex hybrid (Précoce de Fontenay [Early Fontenay] x Cambridge No. 5) x (XXX x Précoce de Fontenay x Rous Lench).

1854 **New hybrid spinach available for fall.**
Seed World 1955 : **77** : No. 5 : p. 39.

Early Hybrid 7 is a cross between the varieties 99 x 95 and Virginia Savoy. It has derived its blue-mould resistance from the former parent and its blight resistance from the latter. An upright, semicompact type suitable for machine picking, it has outyielded standard varieties in the Arkansas valley and southern Texas. Since it bolts readily it is only satisfactory as an autumn crop. The hybrid is suitable for canning and freezing and has received some favourable reports as a variety for transporting in the fresh condition.

1855 JANICK, J. & STEVENSON, E. C.
The effects of polyploidy on sex expression in spinach.
J. Hered. 1955 : **46** : 151–56.

A detailed account is given of the work on crosses between diploid and tetraploid staminate and pistillate plants already summarized in *PBA*, Vol. XXV, Abst. 2458.

1856 JANICK, J. & STEVENSON, E. C.
Genetics of the monoecious character in spinach.
Genetics 1955 : **40** : 429–37.

A fuller account is given of some of the work described in *PBA*, Vol. XXV, Abst. 2458.

1857 JANICK, J. & STEVENSON, E. C.
Environmental influences on sex expression in monoecious lines of spinach.
Proc. Amer. Soc. hort. Sci. 1955 : **65** : 416–22.

Experiments were carried out on the effects of temperature, day length and light intensity on sex expression, with a view to obtaining information likely to be of use in the production of F_1 hybrid seed. A shift towards lower ♀ value in monecious plants and some ♀ plants was brought about by high temperature (80° F.). Evidence was obtained of a temperature-photoperiod interaction, maleness and day length being inversely related at 80° F. in monecious plants. Mean ♀ values at low light intensity were higher than those at normal light intensity, this difference being most pronounced at 80° F. Staminate plants were unaffected by the environmental conditions applied.

1858 WEBB, R. E.
Cotyledonary inoculation, a method for screening spinach for blight resistance.
Phytopathology 1955 : **45** : p. 635.

In breeding for resistance to blight caused by cucumber virus 1, early elimination of susceptible individuals may be effected by inoculation of the cotyledons.

1859 BANGA, O. & VAN BENNEKOM, J. L.
Praktijkproeven knolselderij, 1953–1954. (**Field trials of celeriac, 1953-54**).
Meded. Dir. Tuinb. 1955 : **18** : 801–08.

Some 30 varieties grown in the Netherlands are classified according to uniformity, quality and the morphological characteristics of their leaves

and roots. Breeding for resistance to *Septoria apii* and *Phoma apiicola* is stated to be the most urgent objective in the breeding of celeriac.

1860 Pangalo, K. I.
(Origin and evolutionary trends in cucurbitaceous crops).
Problemy Botaniki (Problems of Botany). Akademija Nauk SSSR : 1955 : **2** : 329–38. [Russian].

On the basis of a study of some 11,000 specimens in the world collection at Leningrad, combined with historical data, it is concluded that the cucurbits originated in the Tertiary period as perennial creepers rather of the type of *Cucurbita okeechobeensis*, in humid tropical forests; the gradual evolution towards lower moisture requirements, terminating in such extreme forms as the xerophytic *Citrullus colocynthis*, was accompanied by a reduction in the area of the leaf lamina and assimilating tissues, the tendrils and climbing tendency and the length of the main stem. Specialization has occurred in a number of other respects too and the ancestral forms are envisaged as undifferentiated types like the water melons of the Kalahari desert, which combine features characteristic of *Citrullus edulis*, *C. colocynthoides* and *C. colocynthis*, and the *Praecitrullus fistulosus* of India, combining features of both melons and water melons (cf. *PBA*, Vol. XV, Abst. 773). The birthplace of the genus *Citrullus* is thus regarded as India, whence it migrated into Africa and into Central Asia: some of the primitive water melons in parts of Soviet Central Asia have many points in common with the *Citrullus ancestralis* of the Kalahari desert. A similar situation is found in the melons: some endemic Indian melons display features corresponding to sections *Eumelonium* and *Melonoidum* of the genus *Melo*; they are classified as *Archimelon* and regarded as relics of an ancestral form which, having originated in India, migrated to Afghanistan, Iran, Central Asia and Asia Minor. On the other hand the gourds are thought to have originated in America and forms combining characters of *Cucurbita maxima*, *C. pepo* and *C. moschata* have been discovered in Central America and named *C. mixta*.

1861 Showalter, A. M.
The inheritance of fruit-shape in *Cucurbita moschata*.
Virginia J. Sci. 1955 : **6** : p. 246. (Abst.).

True-breeding varieties derived from a single ancestor by 15 generations of inbreeding and selection differed markedly in the length/breadth ratios of the fruits. Data from crosses among these varieties suggested that many pairs of alleles were responsible for these differences.

1862 Foster, R. E.
Cantaloups resistant to crown blight.
Progr. Agric. Ariz. 1955 : **7** : No. 2 : p. 5.

A promising strain resembling PMR45 in most characters but having a narrower cavity, higher sugar content and greater resistance to crown blight, a disorder of unknown origin, has been produced at the University of Arizona. Hybridization between resistant stocks and susceptible commercial strains is continuing.

1863 Mohr, H. C., Blackhurst, H. T. & Jensen, E. R.
F_1 hybrid watermelons from open-pollinated seed by use of a genetic marker.
Proc. Amer. Soc. hort. Sci. 1955 : **65** : 399–404.

The hand pollination involved in the present method of producing F_1 hybrid seed can be eliminated by interplanting one inbred parent with another possessing a recessive marker character expressed during the seedling stage so that the nonhybrid plants produced by natural pollination can be readily identified for removal. Using the marker character nonlobing of the leaf, the maximum percentage of hybrids obtained was 36%. Various methods of securing a higher amount of cross pollination are suggested.

1864 Hayase, H. & Hiraizumi, Y.
[Studies on *Cucurbita* crosses. VI. Changes in the optimum conditions for pollen germination (sucrose concentration and pH of the medium) accompanying pollen maturation].
Ikushugaku Zasshi/Jap. J. Breeding 1955 : **5** : 51–60. [Japanese].

In continuation of the researches summarized in *PBA*, Vol. XXIV, Absts. 715 and 718, the authors investigated the optimum conditions for pollen germination of *Cucurbita pepo*, *C. moschata* and *C. maxima*. The optimum pH for pollen germination varies considerably and in nonlinear fashion with the age of the pollen. The optimum sucrose concentration is high at first and drops with age. Tissue extracts of the parental or other species promote the germination of bud but not of mature pollen.

1865 Kravčenko, L. E.
(Mičurinist breeding of cucurbits).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1955 : No. 10 : 81–83. [Russian].

Breeding melons, water melons and pumpkins,

with an emphasis on vegetative hybridization, the use of pollen mixtures and other agrobiological methods, is discussed. Mention is made of an interspecific hybrid from Birjučiĭ Kut distinguished by high yield and good dry-matter content. It was obtained by fertilizing a variety of *Cucurbita maxima* by the pollen of *C. pepo* + *C. moschata.*

1866 Persson, A. R. & Brenna, H. K.
Kultur-, sorts- og stammeforsøk i veksthusagurk. (Cultural, varietal and strain trials of greenhouse cucumbers).
Gartneryrket 1954 : No. 49/50 : Pp. 8.

Of five varieties and an F_1 hybrid tested in 1952 at the Institute of Vegetable Crops of the Agricultural College of Norway, Hunderup gave the highest yield. Butcher Disease Resister F_1 was the best of eight Butcher strains tested in 1953–54.

1867 Hohlačeva, N. A.
(Using pumpkin as a stock for the cucumber).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1955 : No. 11 : p. 29. [Russian].

At Krasnodar, the following changes were observed in the cucumber variety Berliozovskiĭ when grafted on stocks of the pumpkin Perehvatka 69/19 [Girdle 69/19]. It was more vigorous, developed a greater number of ♀ flowers, showed more uniform maturation, ripened 7–9 days earlier and produced more fruits than the ungrafted variety.

1868 Barnes, W. C. & Epps, W. M.
Progress in breeding cucumbers resistant to anthracnose and downy mildew.
Proc. Amer. Soc. hort. Sci. 1955 : **65** : 409–15.

Promising slicing and pickling selections with resistance to both the above diseases have been developed from crosses involving the anthracnose-resistant introduction PI 197087 and downy-mildew resistant lines at the Clemson College Truck Experiment Station, S.C. Anthracnose resistance in PI 197087 is controlled by several major genes and is also affected by modifiers. The brown type of lesion developed by PI 197087 in response to downy mildew infection may endow the derivatives of this introduction with a resistance superior to that of any variety available at present (cf. *PBA.* Vol. XXV, Abst. 1484).

1869 Koot, Y. v. & Dorst, H. J. M. v.
Een nieuwe virusziekte bij komkommers. **(A new virus disease of cucumbers).**
Tijdschr. PlZiekt. 1955 : **61** : 163–64.

A new mutant strain of the tobacco ring spot virus capable of attacking cucumbers is reported from the Netherlands. It gives rise to small, dirty-grey spots on the foliage of the plant and the cucumbers themselves are heavily pitted. Snap beans and tobacco proved susceptible to the new virus when inoculated with sap from infected cucumber plants.

1870 Persson, A. R. & Langvad, B.
Sortimentsgransking i veksthustomat. Observasjoner i samband med foredling. **(Varietal research on greenhouse tomatoes. Observations in connexion with breeding).**
Gartneryrket 1955 : Nos. 10–13 : Pp. 16.

Notes are given on the origin and main characteristics of 18 Scandinavian and other varieties which have been tested at the Institute of Vegetable Crops of the Agricultural College of Norway and other Scandinavian stations.

1871 Walter, J. M. & Kelbert, D. G. A.
Manalucie, a tomato with distinctive new features.
Circ. Fla. agric. Exp. Sta. 1953 : No. S–59 : Pp. 10.

Further information is provided on the above variety (cf. *PBA*, Vol. XXIII, Abst. 3082).

1872 Richards, R. R.
A new tomato "Victor".
Tasm. J. Agric. 1955 : **26** : 287–89.

The results of trials have suggested that Victor is a promising early-ripening variety for irrigated districts in Tasmania. It may also prove useful in isolated areas at high altitudes where most varieties fail to ripen satisfactorily. Victor is now being selected for a more compact bushy habit and increased fruit size but it may be several years before improved selections are available for commercial use.

1873 Clarke, E. J.
Some aspects of tomato breeding at the Albert College.
Sci. Hort. 1955 : **11** : 140–49.

At the Albert College, Dublin, in crosses of the commercial varieties Scarlet Knight, Victory, Ailsa Craig and Potentate with material resistant to *Cladosporium fulvum*, including the Canadian variety Vetomold and the species *Lycopersicon pimpinellifolium*, resistance was dominant and apparently linked with a tendency to produce small fruits, while a genetically

determined leaf-spot necrosis appeared in a quarter of the F_2 plants (cf. *PBA*, Vol. XV, Abst. 1195). F_1 hybrids showing heterosis in respect of yield were obtained from crosses between commercial varieties but not from crosses between commercial and noncommercial types. Yields from crosses within a variety were no better than those from selfed plants. On the basis of the characteristics of the first pair of rough leaves, tomato seedlings are tentatively classified into three groups, the Scarlet Knight, Ailsa Craig and Potentate types.

1874 Butler, L.
A recessive lethal closely linked with wooly in the tomato.
Genetics 1955 : **40** : p. 565. (Abst.).

The occurrence of a recessive lethal, *le*, closely linked with the locus *Wo* for the woolly condition is reported. The following gene order was established: *d—m—dv—ro—aw—Wo—le*.

1875 Bewley, W. F.
Tomato breeding at the Glasshouse Crops Research Institute.
Tomato Cucumber Mark. Bd. J. 1955 : **4** : 367–68.

Breeding is being carried out at the above institute at Toddington, Sussex, England, to develop a variety with all the good characters of Potentate but none of its defects. F_2 hybrids involving Potentate as one parent often gave higher total yields than the F_1 but the latter produced higher yields of early fruit than the F_2 or either parent. Promising combinations are to be selected to obtain fixed strains. Work on F_1 hybrids is to be extended.

1876 Falk, K.
Sortsforsøk med veksthustomater 1953.
(**Trials of varieties of greenhouse tomatoes 1953**).
Gartneryrket 1953 : No. 52 : 2–3.

Information is given on the yields during the first month of picking, the total yields and the reaction to *Cladosporium fulvum* of five varieties tested at a number of stations in Norway. The performance of the F_1 hybrid Single Cross compared favourably with that of the other varieties.

1877 Kulikova, M. F.
(**Utilization of heterosis in Bulgarian horticulture**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1955 : No. 11 : 26–28. [Russian].

The production of hybrid seed of tomatoes, as practised in Bulgaria, is described and data on the fruit yield of the hybrids 10 ♀ x Plovdivskiĭ Konservnyĭ [Plovdiv Processing] ♂ and 10 ♀ x Bison ♂, together with that of the respective pollen parents, are presented. Both hybrids showed a high degree of heterosis.

1878 Quadt, F.
Beobachtungen an den Nachkommen tetraploider Tomatenbastarde. (**Observations on the progeny of tetraploid tomato hybrids**).
Züchter 1955 : **25** : 241–45.

Using artificially-induced tetraploids from the cross *Solanum lycopersicon* 'Condine Red' x *S. racemigerum*, selection was carried out over six generations for (*a*) increased fertility as measured by number of seeds per fruit and (*b*) reduced fertility. The object of the experiment was to discover whether genotype, cell enlargement or meiotic disturbances were responsible for the reduction in the fertility of the 4*n* plants as compared with the original 2*n* forms. In the F_6 it was found that lines of tetraploid plants that had been selected for high fertility had an average of 39 seeds per fruit, whereas those selected for low fertility had approximately 17. Corresponding figures for the diploid controls were 100 and 25–30. During selection, many tetraploids reverted to the diploid state although retaining, in some cases, morphological features, such as broad, vesicular leaves, that had characterized the 4*n* forms. An aneuploid with two supernumerary chromosomes also occurred in the F_6 of one of the 4*n* lines. Cytological investigations failed to suggest any direct relationship between an increase in cell size and reduced fertility, many of the 4*n* forms having larger cells and being, at the same time, more fertile than some of the 2*n* strains that had been selected for low fertility. Likewise, it was concluded that disturbances at anaphase I, observed in all the 4*n* but in none of the 2*n* plants, were not a major cause of reduced fertility, as some lines in which meiotic disturbances were frequent gave higher seed yields than others in which meiotic disturbances were much less pronounced. The results obtained substantiate the author's previous findings (cf. *PBA*, Vol. XIX, Abst. 2963) that the reduced fertility of tetraploid tomatoes is mainly genetically determined and can be improved by selection.

1879 Kasahara, D., Nakamura, T., Ionėjama, Ė. [Yoneyama, E.] & Žuĭkov, G. (Translator)
(**Vegetative hybridization of tomatoes**).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) 1955 : Ser. biol. : No. 5 : 126–34. [Russian].

This account of experiments on tomatoes at

Iwate University, Japan, includes descriptions of the first and second seed generations of the variety Jubilee grafted on New Globe. The first seed generation resembled the stock in respect of fruit colour and weight and number of fruits per plant; the plants were also characterized by greater earliness than the scion. All these characters were transmitted to the second seed generation. Some F_2 plants showed new properties, notably reduced height of the plant, altered leaf shape and a different mode of arrangement of the flowers.

1880 Alpatjev, A. V.
(35 years of tomato breeding).
Agrobiologija (Agrobiology) 1955 : No. 4 : 241–47. [Russian].

This account of tomato breeding at Gribovo deals mainly with Mičurinist methods. Reference is made to some familiar varieties obtained by intravarietal crossing of forms grown in varied environments, training upon rich soil, continuous selection, wide crossing, vegetative rapprochement and crossing forms with a short period from shooting to flowering with those having a short period from flowering to ripening. Mention is made of the new variety Earliana Širokolistnaja [Broad-leaved Earliana], selected from Earliana Gribovskaja grown in an unaccustomed environment. The initial variety pertained to *Lycopersicon esculentum* var. *vulgare*, the new form to var. *grandifolium*. Abrikosovo-Želtyĭ [Apricot-Yellow], another *vulgare* form, was produced from Štambovyĭ Persik Želtyĭ [Determinate Yellow Peach] (var. *validum*). A cross between the new forms Earliana Širokolistnaja and Abrikosovo-Želtyĭ has given a new botanical variety, *validi-grandifolium*, with pink pubescent fruits.

1881 Lesley, J. W. & Lesley, M. M.
The effect in R1, R2, and R3 of treating tomato seeds with X-ray and P^{32}.
Genetics 1955 : **40** : 581–82. (Abst.).

Various structural chromosomal changes and mutants were induced by treating seeds of the inbreds R1, R2 and R3 with 10,000 r. or β radiation from P^{32}. The mutants included some resembling those already known, e.g. wiry (*w*), yellow-flesh (*r*), tangerine flesh (*t*) and anthocyaninless (*a*), but, unlike the *tt* form, the tangerine mutant was virescent, and, unlike the *rr* type, the yellow-fruited mutant tended to be sterile. A new recessive mutation *au* (undescribed) occurred. Forms which were apparently mutants for male sterility, time of fruit ripening, number of loculi and brachytic habit were also obtained.

1882 Choudhury, B.
Inducing polyploidy in *Lycopersicon esculentum* Mill.
Indian J. Hort. 1955 : **12** : 15–18.

The efficiency of treating the seeds and shoots or root tips of seedlings with concentrations of 0·2% and 0·4% colchicine for 48, 96, 144 and 192 hours was investigated in the tomato Potentate. The highest percentage of polyploids (16·67%) was obtained by applying colchicine in an emulsion of lanolin, stearic acid, morpholine and water to the shoot tips of seedlings, using 0·2% for 192 hr. or 0·4% for 144 or 192 hr.

1883 Lehmann, C. O.
Das morphologische System der Kulturtomaten (*Lycopersicon esculentum* Miller).
[**The morphological systematics of the cultivated tomato (*L. esculentum* Miller)**].
Züchter 1955 : **3.** Sonderheft : Pp. 64.

The morphological characteristics of the genus *Lycopersicon* are discussed with special reference to *L. esculentum* and some 250 varieties of the cultivated tomato are classified into botanical varieties, provars and convars according to various morphological criteria. Historical evidence concerning the origin of the cultivated tomato and published information on the geographical distribution of the different *Lycopersicon* species are summarized and questions concerning the centre of origin of the tomato and its putative original form are discussed. It is assumed that *L. esculentum* and *L. pimpinellifolium* are derived from a common ancestral form and similarities and dissimilarities between these two species are indicated. Indexes of Latin botanical names and of the names of the varieties classified are provided, as is also a bibliography of 106 works.

1884 Jenkins, J. A. & Mackinney, G.
Carotenoids of the apricot tomato and its hybrids with yellow and tangerine.
Genetics 1955 : **40** : 715–20.

Jenkins, J. A. & Mackinney, G.
Carotenoids of the apricot tomato.
Ibid. 1955 : **40** : p. 577. (Abst.).

The mutant fruit colour termed apricot depends upon a recessive gene, *at*. In its main effect of suppressing the formation of lycopene, *at* behaves in a similar manner to *r* for yellow fruits (cf. *PBA*, Vol. XXIII, Abst. 741). In the double recessives yellow-apricot (*rr atat*) and tangerine-apricot (*tt atat*) the carotenoids of the lycopene complex are reduced in amount, the main constituent being prolycopene. In

the double recessive yellow-apricot, the supressing action of the two genes is reinforced so that no lycopene is produced. Content of β carotene is unaffected by *at* or *t* and decreased by *r*, but in the double recessive yellow-apricot the inhibiting effect of *r* is enhanced and in tangerine-apricot fruits the combination of *t* and *at* has nearly as marked an effect in decreasing β carotene content as the combination of *r* and *at*.

1885 Castronovo, A. & Avila, A.
El método refractométrico y la selección de variedades industriales de tomate. (**The refractometric method and the breeding of industrial varieties of tomato**).
Rev. Invest. agríc. B. Aires 1953 : **7** : 5–23.

By the use of a hand refractometer it has been possible to make estimations of the dry-matter content of tomatoes from a few drops of juice. The estimations can be made in the field and the figures obtained have conformed well with those obtained from gravimetric analyses. Comparison of data obtained from different fruits showed that it is not necessary for the fruits to be absolutely ripe; that fruits growing in shade had roughly the same values as those on the same plant exposed to sunlight; that the values were influenced to a certain extent by weather conditions and the time of day at which the fruits were picked; that for breeding purposes reliable results can be obtained from fruits that have been stored for one or two days after picking; and that a minimum of five fruits per plant should be used to obtain reliable estimations with standard errors of less than 5%.

1886 Böszörményi, Z.
Adatok a paradicsom termés-morfogeneziséhez. (**Data on the morphogenesis of productivity in the tomato**).
Magyar TudEgyetem. biol. Intéz. Évkön. 1951 : **1** : 201–13.

Correlations are worked out between position in the inflorescence, petal number, sepal number, locule number and fruit weight in a series of varieties grown normally and under conditions of water shortage.

1887 Fukushima, Y., Masui, M., Suzuki, M. & Totsuka, K.
(**On a comparison of varieties of greenhouse tomatoes**).
Shizuoka Daigaku Nogakubu Kenkyu Hokoku/Rep. Fac. Agric. Shizuoka Univ. 1954 : No. 4 : 1–6. [Japanese].

A series of varieties commonly grown in Japanese greenhouses was compared in respect of flowering and fruiting period of the successive trusses, fruit yield, number and size of leaves and effect of hormone applications. Conspicuous varietal differences were noted in respect of the flowering and maturation period of the second and later trusses. With some exceptions, a positive correlation was noted betwen fruit yield and total leaf area.

1888 Roll-Hansen, J. & Vibstad, A.
Veksthustomat på Kvithamar 1952–1953. Forsøk med sorter, damping og behandling med magnesiumsulfat. (**Greenhouse tomatoes at Kvithamar, 1952-1953. Experiments with varieties, steam sterilization and treatment with magnesium sulphate**).
Gartneryrket 1954 : No. 11 : 6–15.

From the results of trials conducted at Kvithamar, Norway, it is concluded that Potentat, Selandia and Kvithamar are equal in yield, the last-named being the most resistant to the prevalent race of *Cladosporium fulvum* but rather sensitive to magnesium deficiency. The Netherlands F_1 hybrid Single Cross has shown promise.

1889 Kelbert, D. G. A. & Walter, J. M.
Manalee, a disease-resistant early tomato.
Circ. Fla. agric. Exp. Sta. 1954 : No. S–72 : Pp. 8.

Manalee, resistant to wilt (*Fusarium oxysporum* var. *lycopersici*), grey leaf spot (*Stemphylium solani*), early blight (*Alternaria solani*) and leaf mould (*Cladosporium fulvum*) is described in detail (cf. *PBA*, Vol. XXIV, Abst. 3457).It was developed from [W41–2 x B114 (Pan America x Vetomold)] x [W41–3–2 x B111 (Nordake x Marglobe)]. The wilt-resistant W41 lines involved *Lycopersicon pimpinellifolium*, Indiana Baltimore, Rutgers and Ruby Queen in their pedigree. B114 combined resistance to wilt and leaf mould; B111 carried resistance to *A. solani*.

1890 **Improved pulses in Madras State.**
Indian Fmg. 1955 : **5** : No. 6 : 34–35.

Notes are given on improved strains of *Cajanus indicus, Phaseolus radiatus, Ph. mungo, Dolichos biflorus, D. lablab, Cicer arietinum* and cowpea, selected during 1943–53 at Coimbatore and two subsidiary stations in Madras.

1891 Picard, J., Berthelem, P. & Félix, L.
La culture de la féverole-grain. Quelques données d'expérimentation réalisée, en 1952, 1953 et 1954 dans la moitié nord de la France. (**The cultivation of the broad bean. Some results of experiments carried out in 1952, 1953 and 1954 in the northern half of France**).
Ann. Inst. nat. Rech. agron., Paris 1955 : Sér. B : **5** : 79–102.

Data on earliness, yield and size of bean are given for a number of varieties of French and foreign origin and recommendations, based on trials conducted at a number of centres, are made as to varieties and strains suitable for cultivation in different parts of northern France. Improved resistance to low temperatures and, especially in the case of small-grained varieties, higher productivity are stated to be the aims that require most attention in future breeding programmes.

1892 Wolf, E. A. & Hills, W. A.
Seminole—a new disease resistant, green, round-podded bush bean.
Circ. Fla. agric. Exp. Sta. 1954 : No. S–73 : Pp. 6.

The above variety is described in detail (cf. *PBA*, Vol. XXIII, Abst. 3101). It was selected from line B2884 [(Commodore x Black Valentine) x Blight-resistant Green Pod]. The pedigree of the last-mentioned variety includes Mosaic-resistant Great Northern Idaho 1, Black Valentine, US1 and Mosaic-resistant Refugee Rogue (Corbett).

1893 Wiebosch, W. A. & Buishand, T.
Landelijke beproeving van enige stamslabonenrassen. (**National trial of some varieties of French bean**).
Med. Proefsta. Groenteteelt volle Grond 1955 : No. 2 : Pp. 36.

The results of yield trials of 13 varieties at 31 different centres in the Netherlands are summarized. In addition, data on the principal morphological characters of the main varieties and on varietal differences in susceptibility to virus diseases, halo blight, foot rot, rust and anthracnose are given. Dubbele witte zonder draad [Stringless double white] and the new variety Voorluk were among the highest yielders at most centres, except under conditions of heavy infection by Phaseolus virus 1, to which Dubbele witte zonder draad proved highly susceptible.

1894 Buishand, T.
Enige ervaringen met het veredelen van bonen (*Phaseolus* spp.). [**Some experiences with the breeding of beans (*Phaseolus* spp.)**].
Med. Proefsta. Groenteteelt volle Grond 1955 : No. 1 : Pp. 48.

The first part of this treatise is devoted to a discussion of the different techniques employed in the artificial pollination of beans at the Alkmaar Vegetable Research Station, Netherlands. The second part gives the results of some preliminary crosses carried out there and lists the future objectives of the breeding programme, which include improved yield and quality, increased resistance to virus diseases, *Colletotrichum lindemuthianum*, *Uromyces phaseoli* and *Pseudomonas phaseolicola* and the development of new varieties resistant to low temperatures. The Central American short-day species *Ph. dumosus* has been crossed with *Ph. vulgaris* with a view to transferring genes for resistance to virus and other diseases to cultivated varieties.

1895 Honma, S.
A technique for artificial culturing of bean embryos.
Proc. Amer. Soc. hort. Sci. 1955 : **65** : 405–08.

In experiments on culturing embryos of *Phaseolus vulgaris* x *Ph. acutifolius*, four mature plants were obtained when the sucrose concentration of the liquid nutrient medium was gradually changed from 4 to 0%.

1896 Freytag, G. F.
Variation of the common bean (*Phaseolus vulgaris* L.) in Central America.
Diss. Abstr. 1955 : **15** : Publ. No. 11, 560 : p. 679.

The foci of variation in Central American populations appear to be the following two extreme forms: (1) a long-seeded type of *Ph. vulgaris* with determinate plant growth; and (2) a previously unknown species designated Tropical Black, with small black seeds, vinelike habit and purple pigmentation of the whole plant.

1897 Huffington, J. M.
Better green beans.
Canner 1955 : **120** : No. 28 : 13–17.

Information is given on the canning quality of experimental USDA lines and commercial

varieties grown in tests in different states during 1954.

1898 Schuster, M. L.
A method for testing resistance of beans to bacterial blights.
Phytopathology 1955 : **45** : 519–20.
A technique for inoculation is described which involves spraying the leaves with the appropriate bacterial suspension so that the pathogen is forced through the stomata. The procedure can be used in the field or in the greenhouse.

1899 Kendrick, J. B. (Jun.) & Allard, R. W.
Lima bean tolerant to stem rot.
Calif. Agric. 1955 : **9** : No. 10 : 8, 15.
L–4 has shown outstandingly high resistance to hypocotyl decay caused by *Rhizoctonia solani*. Selected lines of this strain are to be used in improving the resistance of Concentrated Fordhook.

1900 Sinclair, J. B. & Walker, J. C.
Inheritance of resistance to cucumber mosaic virus in cowpea.
Phytopathology 1955 : **45** : 563–64.
The results of crosses between a susceptible line of Black and three resistant varieties indicated that resistance is determined by a single dominant gene.

1901 Weiss, M. G. & Stevenson, T. M.
Registration of soybean varieties, V.
Agron. J. 1955 : **47** : 541–43.
Descriptions are given of Dortchsoy 67 (cf. *PBA*, Vol. XXIII, Abst. 783), Dorman (cf. *PBA*, Vol. XXIII, Abst. 778), Capital (cf. *PBA*, Vol. XVIII, Abst. 1948), Harosoy (cf. *PBA*, Vol. XXV, Abst. 2856) and Improved Pelican (cf. *PBA*, Vol. XXIII, Abst. 1584), all of which have been registered in the USA in 1955.

1902 Probst, A. H.
Clark soybeans for Indiana.
Sta. Bull. Ind. agric. Exp. Sta. 1955 : No. 626 : Pp. 8.
Further information on the variety Clark [Lincoln x (Lincoln x Richland)] is provided (cf. *PBA*, Vol. XXIV, Abst. 751).

1903 **Grant, a new northern variety.**
Soybean Dig. 1955 : **15** : No. 12 : 6–7; and Seed World 1955 : **77** : No. 7 : p. 20.
Grant, a high-yielding soya bean developed from Lincoln x Seneca by the US Department of Agriculture in cooperation with the Agricultural Experiment Stations of Wisconsin and South Dakota, is adapted for production in the two last-mentioned states. Its oil content is 20·2% and its maturation period is the same as that of Mandarin (Ottawa).

1904 Johnson, H. W., Robinson, H. F. & Comstock, R. E.
Genotypic and phenotypic correlations in soybeans and their implications in selection.
Agron. J. 1955 : **47** : 477–83.
Details are presented of phenotypic and genotypic correlations between 24 characters in two populations and estimates are given of the expected increases in yield and oil content, respectively, resulting from selection based on a character or combination of characters associated with yield or oil content. For increasing yield, a selection index based on length of fruiting period and seed weight would be as efficient as selection for yield itself and would be rendered slightly more efficient by the addition of lodging resistance, oil percentage and protein percentage to the index. Selection indices for oil content were estimated to be less effective than selection for oil percentage alone.

1905 Scarascia, G. T. & Di Guglielmo, C.
Mutazioni cromosomiche spontanee in *Soja hispida*. (**Spontaneous chromosome aberrations in *S. hispida*).**
Ann. Sper. agr. 1955 : **9** : 1269–73.
The frequency of chromosome aberrations observed at anaphase in the root tips of seedlings rose slowly with length of storage before germination.

1906 Yoshino, Y., Ozaki, K. & Sato, M.
(Studies on the breeding of soya beans with a high oil content. I. The relations between oil content and other important characters in early generations of crosses).
Hokkaido Nogyo Shikenjo Iho/Res. Bull. Hokkaido agric. Exp. Sta. 1955 : No. 68 : 15–24. [Japanese].
The heritabilities (percentage genotypic variance in the F_2) of flowering date, maturation period, height, number of nodes per main stem, number of branches, pod number, seed weight per plant and specific gravity of the seed were determined for a series of 11 intervarietal crosses. Correlations between the various characters were also worked out. A marked positive correlation was detected between specific gravity of the seed and maturation period; there was little correlation between specific gravity and weight of seed per plant.

1907 Bonifacio, G.
Le conquiste genetiche sulla soia conferiscono a questa coltura il più alto interesse. (**The genetical successes with the soya bean render this crop of the highest interest**).
G. Agric. Domen. 1955 : **65** : p. 278.
A brief survey is given of preliminary experiments on the adaptation of introduced varieties, mainly from the USA, to Italian conditions.

1908 Gray, S. G.
Experiments with soybeans in Australia.
Tech. Pap. Div. Pl. Industr. Aust. 1955 : No. 4 : Pp. 18.
Tests of over 300 introductions from 18 countries, carried out during 1944–51, have provided a clear indication of varietal adaptability over an extensive latitudinal range in Australia and revealed a consistent relationship between latitude and maturity. The most suitable varieties at each locality were those obtained from comparable latitudes overseas. Suggestions are made concerning appropriate countries from which additional introductions should be sought and concerning further investigations, including local selection and progeny testing.

1909 Paci, P.
Contributo allo studio delle cultivar di pisello coltivate presso il Centro Miglioramento Piante Ortofrutticole di Firenze. (**Contribution to the study of the pea cultivars grown at the Centre of Horticultural Plant Breeding at Florence**).
Riv. Ortoflorofruttic. ital. 1955 : **39** : 503–21.
Descriptions are given of 15 varieties of pea, information being given on their origin, morphological and horticultural characteristics, yield and quality. Both Italian and imported varieties appear amongst those recommended on account of yield, earliness, disease resistance or quality.

1910 Capucijners en rozijnerwten, 1956. (**Dun peas and maple peas, 1956**).
Landbouwvoorlichting 12 : Bijl. 17; Ber. Rassenkeuze 1955 : No. 197 : unpaginated.
Data on yield, growth habit, suitability for mechanical harvesting, disease resistance, size of pea and nutritive value are presented for the dun pea varieties Aureool [Halo] and Dolfijn [Dolphin] and for the maple pea varieties Ivora, Koroza, Vinco and Eroica. The above are the principal varieties of dun and maple peas grown in the Netherlands.

1911 Ronde groene erwten, 1956. (**Round blue peas, 1956**).
Landbouwvoorlichting 12 : Bijl. 15; Ber. Rassenkeuze 1955 : No. 195 : unpaginated.
Data on yield, quality and resistance to diseases are presented for six established varieties and four new varieties. In the south-western and central marine clay districts of the Netherlands, where peas are particularly susceptible to top yellows, the resistant varieties Rondo CB, Vares, Virtus and Mansholt's 2152 gave the best results. Mansholt's 2152, a new variety still undergoing trials, is described as a late-maturing variety suitable only for fertile soils. It has a short flowering season and produces small peas of good quality. In the northern alluvial clay belt, Vares, Rondo CB and Servo gave the best results. Servo was the most productive variety on sandy or light soils. Vares was the only variety resistant to *Fusarium oxysporum* f. *pisi*, a disease that is rapidly gaining ground in the Netherlands.

1912 Schokkers, 1956. (**Marrowfats, 1956**).
Landbouwvoorlichting 12 : Bijl. 16; Ber. Rassenkeuze 1955 : No. 196 : unpaginated.
Brief descriptions of Zelka, Big Ben, Emigrant, Mansholt 2407 and CB48–4 are given, together with details of their performances in yield trials on different types of soil in the Netherlands. All the above variaties are resistant to top yellows and *Fusarium oxysporum* f. *pisi*. The highest yields were given by Big Ben and Emigrant.

1913 Kivi, E. I.
Kalleherne. (**Kalle pea**).
Siemenjulk. Hankkijan Kasvinjalos-Laitos Tammisto 1955 : 119–22.
This recently released variety is derived from Torsdag [Thursday] x Folger and is a reliable grower with good culinary properties. Comparative data are given for yield and vegetative period in Kalle, Torsdag II and Sinikka. Kalle has a longer growing period than Torsdag II but the yield is almost the same.

1914 Paton, D. M. & Barber, H. N.
Physiological genetics of *Pisum*. I. Grafting experiments between early and late varieties.
Aust. J. biol. Sci. 1955 : **8** : 231–40.
Experiments on seedlings of the early-flowering pea variety Massey and late-flowering variety Telephone at the University of Tasmania suggested that the later variety produced a

substance inhibiting flowering, this inhibitor being produced in the cotyledons and transported to the plumule. The inhibitor was able to pass graft unions and altered the flowering behaviour of early scions.

1915 Rüdiger, W.
Verbänderungen — Missbildung und Züchtungsziel. (**Fasciation—deformity and breeding objective**).
Umschau 1953 : **53** : 500–01.

Fasciation and its causes are discussed. In view of the frequently luxuriant growth of fasciated plants it is suggested that increased yields may result from breeding for fasciation; reference is made to promising results already obtained by H. Scheibe with fasciated peas, in which flowering and fruit formation are more uniform than in normal plants.

1916 Hillmann, H. D.
Untersuchungen über die Kornfarbe gelb- und grünsamiger Speiseerbsen. (**Investigations on the grain colour of yellow-seeded and green-seeded garden peas**).
Z. Pflanzenz. 1955 : **35** : 51–88.

The results of trials of yellow peas to determine which varieties produce the highest proportion of pure yellow seeds are reported, together with observations made on the F_1–F_3 of crosses between green and yellow peas to obtain information on genetical factors influencing the expression of the character yellow seed. In the variety trials marked differences were observed in the percentage of pure yellow seeds produced by the different varieties and in the extent to which the seed colour was influenced by environmental factors such as temperature and amount of direct sunlight. Some varieties produced pure yellow seeds under all conditions; others yielded varying percentages of greenish-yellow peas according to the environmental conditions under which they were grown. In the hybrid progeny of green peas pollinated with pollen from yellow peas a wide range of intermediate stages of testa colouring was observed in the F_2 and F_3, indicating the existence of a large number of minor additive genes for testa colour. No evidence was obtained in support of the hypothesis that testa colour was cytoplasmically determined. The characters long internode and yellow pod were found to be associated with yellow seed. No association was established between testa colour and degree of greenness of the foliage. It is concluded that pea strains with seeds of a pure yellow may be obtained by selection for this character. Yellow peas should not be grown under conditions, such as strong sunlight, which are conducive to the formation of chlorophyll.

1917 Åvall, H. & Hintze, S.
Skördetidsförsök med konservärter. (**Harvest-time experiments with canning peas**).
Medd. Trädgårdsförs. 1955 : No. 93 : Pp. 19.

In trials conducted at Alnarp and other stations in Sweden, the round shelling pea Alaska and the marrowfats Kelvedon Wonder/54 and Delikatess/54 were harvested at intervals over a period of ten days and tested for quality by means of a texturemeter. Quality decreased with each picking, the rate of decrease being lowest in Delikatess and highest in Alaska. The total amount of heat required during the growing season differed for each variety.

1918 Schneider, A.
Über den Reifeablauf von Gemüseerbsen und die Bestimmung des optimalen Pflücktermins mit Hilfe des Texturemeters. (**On the maturation of garden peas and the determination of the optimum time of picking with the aid of a texturemeter**).
Züchter 1955 : **25** : 302–09.

The method described was developed at the Quedlinburg Plant Breeding Institute, Eastern Germany, and enables the tenderness of the pea, testa thickness and sugar and starch contents to be determined with a high degree of accuracy. Tabulated data, based on tests carried out using this technique, are presented on the comparative suitability for canning purposes of 36 varieties and experimental lines. A high positive correlation was established between the firmness of the peas and their dry matter content; sugar content and starch content were negatively correlated.

1919 Buxton, E. W.
Fusarium diseases of peas.
Trans. Brit. mycol. Soc. 1955 : **38** : 309–16.

Information on races of *F. oxysporum* f. *pisi* occurring in eastern England is included. Most isolates were pathogenically similar to the American race 1 but one culture infected Delwiche Commando and New Era, both resistant to races 1 and 2. This form has been provisionally designated race 3A; in its pathogenicity it resembles race 3 identified by Schreuder (cf. *PBA*, XXII, Abst. 1698).

1920 Kiss, Á.
Növénynemesítés és a borsózsizsik (*Bruchus pisorum* L.) elleni küzdelem. [**Plant breeding and control of the pea weevil (*B. pisorum* L.)**].
Növénytermelés 1953 : **2** : 36–53.

No resistant peas have been found so far in the collection at Martonvásár. Preliminary crossings among peas and related genera have been undertaken with the aim of obtaining resistant material.

1921 de Fluitter, H. J. & Hubbeling, N.
Waarnemingen over topvergeling bij erwten. (**Observations on top yellows of peas**).
Tijdschr. PlZiekt. 1955 : **61** : 165–75.

The results of experiments are reported indicating that the yellowing and curling of the top leaves of peas are not due exclusively to attack by *Fusarium solani* but are frequently caused by a virus disease transmitted by pea aphids from infected pea, broad bean, lucerne and white clover plants. Varietal differences in susceptibility to the virus are reported by the Institute of Plant Pathology, Wageningen. Rondo, Erecta and Parel [Pearl] possess a high degree of resistance whereas Unica is extremely susceptible.

1922 Persson, A. R. & Brenna, H. K.
Sukkermais. (**Sweet corn**).
Gartneryrket 1954 : No. 48 : Pp. 11.

On the basis of trials carried out at the Institute of Vegetable Crops of the Agricultural College of Norway, the hybrids Marcross, Marcross Northern, Mette and Miniature are recommended for cultivation in Norway.

1923 Thomas, W. I.
Transferring the Ga^s factor for dent-incompatibility to dent-compatible lines of popcorn.
Agron. J. 1955 : **47** : 440–41.

In transferring the Ga^s factor (cf. Abst. 387) to dent-compatible lines (*gaga*) by the backcrossing technique the heterozygous and homozygous (*gaga*) back-cross plants were distinguished by allowing them to pollinate a Ga^sGa^s tester stock, which *ga* pollen is unable to fertilize. In order to isolate the Ga^sGa^s progeny of selfed Ga^sga plants, the S_1 plants were pollinated by a *gaga* stock with purple aleurone, giving Ga^sga and *gaga* individuals with many purple kernels and Ga^sGa^s plants with very few or none.

1924 Linnert, G.
Cytologische Grundlagen für Sterilitätserscheinungen in der Gattung *Salvia*. (**Cytological bases for manifestations of sterility in the genus *Salvia***).
Züchter 1955 : **25** : 237–41.

Pollen grains of *S. nemorosa* ($n = 7$) and *S. officinalis* ($n = 7$) were cytologically examined to obtain information on the causes of pollen sterility in the genus *Salvia*. In *S. nemorosa*, plants develop apparently normal anthers that are, however, devoid of pollen grains at maturity. It was shown that the pollen mother cells of this species develop normally up to and including pachytene, but then suddenly disintegrate. This phenomenon appears to be genetically determined, either on a cytoplasmic or caryological basis. It is preceded by a lowering of the chromatin content in the chromosomes and is thought to be brought about either by the pollen mother cells being deprived of the nutriment they require or by the production of toxic substances by the pollen grains or the tapetum. The high percentage of pollen sterility found in *S. officinalis* was shown to result from irregular division at prophase II. The causes appear to be physiological and possibly due to a disturbance in nucleic acid content brought about by an interaction between the euchromatin and heterochromatin and the nucleolus. The occurrence of cytomixis, common to most species of *Salvia*, is discussed briefly with special reference to its influence on pollen sterility.

BOOK REVIEWS

Cattell, J. (Editor)
American men of science. Vol. II. Biological sciences.
The Science Press, Lancaster, Pa. & R. R. Bowker Company, New York 1955 : 9th ed. : $20 : Pp. 1276.

First published in 1906, the directory *American Men of Science* has provided information on the personnel associated with the physical, biological and social sciences in the United States for almost half a century, presenting the biographical items under one cover up to and including the eighth edition in 1949, which reached the outsize of nearly 3000 pages. The only solution to the problem of unwieldy dimensions was division and Volume II of the

ninth and most recent edition is one of the products of this fission, the others being Volume I for the physical sciences and Volume III (not yet published) for the social sciences. Volume II contains biographical notes on about 25,000 scientists concerned with zoology, botany, medical research and affiliated fields. It also includes some 5000 names serving as cross references to biographies of scientists engaged in relevant fields, such as biochemistry and biophysics, covered in Volume I.

Nielsen, K. L.
Methods in numerical analysis.
The Macmillan Co., New York & London 1956 : 48s. 6d. : Pp. xiii + 382 : tables.

Numerical analysis has developed very rapidly in recent years, largely because of the success that has been achieved in reducing the time taken for solving problems by using automatic calculators, in particular electronic digital computers. In the above book, Dr. Nielsen deals with the following applications: the calculus of finite differences, interpolation, differentiation and integration, Lagrangian formulae, the numerical solution of linear and nonlinear equations, finding the complex roots of algebraic equations, the solution of differential, difference and partial differential equations, the method of least squares, and periodic and exponential functions.

The book is stated to be intended for the practical man, but in spite of the importance of the subject for statistical work and for some problems in population genetics, it is unlikely that it will prove of great assistance to any but professional mathematicians, the exposition being highly technical and not particularly easy to follow.

Wishart, J. & Sanders, H. G.
Principles and practice of field experimentation.
Commonwealth Agricultural Bureaux, Farnham Royal 1955 : 2nd ed. : Tech. Comm. No. 18 of the Commonwealth Bureau of Plant Breeding and Genetics, Cambridge : 21s. : Pp. vii + 133 : tables.

The first edition of this well-known handbook on field experimentation was published by the Empire Cotton Growing Corporation in 1935 and reviewed in *PBA*, Vol. VI, p. 207. The present edition is issued as a technical communication of the Commonwealth Bureau of Plant Breeding and Genetics, Cambridge. As in the first edition, the book is in two parts; of these Part I—Principles has been almost completely rewritten, while Part II—Practical Considerations has only been the subject of minor alterations. The principal additions in Part I deal with split plots, confounding, lattices and balanced designs, methods which have been greatly developed since the first edition appeared. There are still comparatively few really satisfactory introductions to statistical methods for agricultural research workers unequipped with specialized mathematical knowledge; the present edition should prove as useful in this respect as its predecessor.

Hrubý, K. & Konvička, O.
Polní pokusy, jejich zakládání a hodnocení. (**Field experiments, their design and computation**).
Olomouc 1954 : Kčs. 35 : Pp. 276 : 68 figs. : 177 tables.

This manual is a straightforward introduction to statistical methods for plant breeders and other agricultural research workers in Czechoslovakia. After a preliminary account of statistical principles, the authors proceed to the simpler standard layouts and then to methods of analysing the results, in particular by analysis of variance. Practical details are considered in a special chapter, the emphasis being on vegetable crops. The numerical data used for illustration are largely derived from unpublished results of field trials at the Olomouc Vegetable Research Institute. The last chapter comprises standard statistical tables.

The treatment throughout is based on the statistical methods developed in Great Britain and the United States on the basis of Fisher's work, though incidental reference is made to German and Russian techniques.

Frets, G. P.
The heredity of the size and shape of the seeds of *Phaseolus vulgaris*.
Martinus Nijhoff, The Hague 1955 : 2.80 guilders : Pp. 22 : figs. : tables.

This paper supplements the author's publication in 1954 in which he presented an account of the results of the investigations forming the basis of his hypothesis of independent and polymeric control of the three dimensions of the seeds of *Ph. vulgaris* (cf. *PBA*, Vol. XXV, p. 106). As additional support to his theory, he now gives in detail data obtained in the 'thirties, on the variability in the dimensions of the F_3 beans produced by F_2 individual plants derived from two F_1 plants from pure-line crosses. Dr. Frets also discusses his hypothesis in relation to work on the inheritance of fruit shape and size in the tomato by Lindstrom and others, and in the

cucurbits by Sinnott. As in the 1954 publication, the author writes in a highly confused manner which does not appear to be entirely due to the fact that he is not writing in his native language. He again concludes with rather pointless comments on the German idealistic philosophers in relation to heredity.

HUNDT, R.
Von den ältesten Landpflanzen. (**About the oldest land plants**).
Die neue Brehm-Bücherei, Leipzig und Wittenberg 1952 : DM 1.50 : Pp. 43 : 38 figs.

In this small booklet the author describes specimens of early Psilophytales found in deposits in Franconia and eastern Thuringia in Germany and belonging to the upper lower Llandovery, corresponding to Lapworth zones 11 to 12b; thus they are regarded as forerunners of the Australian *Yarravia* and *Baragwanathia*. The general importance of the Psilophytales as representing an intermediate stage between the algae and the vascular plants is explained.

KURTH, H.
Die Jarowisation landwirtschaftlicher Kulturpflanzen. (**Vernalization of agricultural crop plants**).
Die neue Brehm-Bücherei, Wittenberg 1955 : DM 2.25 : Pp. 44 : 30 figs. : 11 tables.

This small booklet gives a general explanation of the principles of Lysenko's method of vernalization (cf. *PBA*, Vol. VI, p. 329) and of its application in agriculture and in plant breeding. Some details are given regarding the vernalization requirements of some of the German varieties of cereals and other crop plants. Experiments carried out in Germany have shown that vernalization of winter cereals and winter rape brings about a considerable fall in yield and its application in practical agriculture is therefore out of the question except in cases of emergency. Vernalization of winter vetch (*Vicia villosa*) however led to earlier flowering and a 20–50% increase in seed yield. Yield increases have been obtained in spring barley and oats, *Lupinus angustifolius* and certain other plants and the method is also being used to induce flowering in beets and certain other root crops and forage plants.

KAUSSMANN, B.
Histogenetische Untersuchungen zum Flachsprossproblem. (**Histogenetic investigations into the phylloclade problem**).
Gustav Fischer Verlag, Jena 1955 : DM 11.30 : Pp. 136 : 63 figs.

The Asparageae have come to be regarded as problem plants, on account of their tendency to flaunt unconventional organs under the noses of bewildered botanists. For well over a hundred years morphologists have debated whether the so-called phylloclades of such genera as *Asparagus* and *Ruscus* are foliar or cauline in nature, and in the present volume Dr. Kaussmann leaps into the fray on the side of the cauline party. The material investigated comprised *Semele androgyna, Myrsiphyllum asparagoides, Ruscus aculeatus, R. hypophyllum, Asparagus falcatus, A. sprengeri* and *A. plumosus*. In each of these species the mode of histogenic development of the growing points of the phylloclades was investigated and compared with that of the growing points of corresponding terminal and lateral shoots and of leaf primordia. It is shown that the ontogeny of the phylloclades resembles that of a lateral shoot whence the author infers that the phylloclades are cauline in nature.

Dr. Kaussmann has made a valuable contribution to our knowledge of phylloclade histogeny. It is a pity, however, that this is interpreted in the light of the stiff Platonic morphology of the text books. It is evident enough that phylloclades have cauline characteristics; it is equally clear, as Arber and others have shown, that they also possess foliar qualities. Some botanists have gone as far as suggesting that one half of a phylloclade may be cauline and the other half foliar; is it not time now to take the next step and concede that the whole organ can be simultaneously cauline and foliar?

KNAPP, R.
Experimentelle Soziologie der höheren Pflanzen. (**Experimental sociology of the higher plants**).
Verlag Eugen Ulmer, z. Zt. Ludwigsburg/Württemberg 1955 : Vol. 1 : DM14.50 : Pp. 202 : 50 figs. : 65 tables.

In the first volume of the above work, Dr. Knapp provides a useful compendium of data on the physiological basis of synecological relationships between plants. There are four sections. The first is introductory and is followed by a general account of the ways in which plants interact with one another, in particular with respect to water supply, nutrients, light, temperature, the secretion of toxic substances and the formation of litter. In this, as in the last two sections, the author draws on a wide range of examples, predominantly German, from ecological, agronomic and forestry investigations and from physiological studies in the laboratory.

The third section is devoted to the germination and early growth of seedlings. The effects of type of soil and temperature on germination are considered, as well as intraspecific and interspecific competition between seedlings.

The last section is the longest and is concerned with adult communities. It consists of two subsections, dealing with communities composed of one or several species, respectively. Among the interactions considered are competitive effects on growth, flowering and fruiting, root competition, the persistence of the individual component species of a complex community, and the effect of the community as a whole on the morphology and development of the individual components. The genetic problems touched upon include the effect of strain on persistence and the selective effect of the environment created by the community on the genotypes of its components.

The presentation is very condensed; the numerous examples are introduced with a minimum of comment and there is comparatively little discussion.

Volume II is to deal with community dynamics and experimental methods.

KLIKA, J.
Nauka o rostlinných společenstvech. (Fytocenologie). [**The science of plant communities (phytocenology)**].
Čs. Akademie Věd, Praha 1955 : Bound 39, 20 Kčs : Pp. 354 : illus. : tables.

In this ecological textbook, Prof. Klika provides a general account of synecological principles following largely along the lines advocated by Braun-Blanquet. Plant communities are described in the usual way in terms of such concepts as stratification and frequency and the dynamics of succession are also explained. Special attention is given to the relationships between communities and environmental factors and to biotic interactions within the communities themselves. As is so often the case in synecological treatises, the exposition is frequently abstruse and makes use of such scientifically suspect concepts as dialectical unity subsisting between plant communities and their environment. A schematic synopsis of Central European plant communities, using Braun-Blanquet's terminology, is included.

NEMČINOV, V. S. (Chief editor)
(The K. A. Timirjazev Agricultural Academy).
Ogiz-Seljhozgiz, Moskva 1946 : 15.00 r. : Pp. 391 : illus. : tables. [Russian].

The Petrovskaja Academy founded in 1865 and renamed as the Timirjazev Agricultural Academy in 1918 had intended to bring out a special jubilee volume in 1941 giving an historical account of past and present research at the institute. The war, however, prevented publication until 1946 when the present, much abridged, version was produced. Still a sizeable book, and embellished by many photographs, it deals with the early history of the institute, mentions many personalities associated with its activities, and gives reports of the work of the different faculties, including those concerned with plant breeding and genetics. In the section on genetics and cytology, experiments are described in which the increased yield obtained from intravarietal crossing was shown to be the result of the superior growing conditions of the experimental plot and no effect at all was observed when experimental and control plants were grown under identical conditions.

Reference is made to the fertile hybrids of *Triticum durum* x *T. timopheevi* and *T. durum* x *T. monococcum* obtained by colchicine treatment by A. R. Žebrak in 1938 (cf. *PBA*, Vol. X, Absts. 391–2) and to later crosses in which hybrids of *T. timopheevi* were obtained with *T. vulgare*, *T. durum*, *T. turgidum*, *T. persicum*, *T. orientale* and *T. polonicum*; a list is given of 27 interspecific combinations obtained, some of them having $2n = 42$, some 56 and some 70.

The breeding work at the Academy was started as early as 1903 by D. L. Rudzinskiĭ and later carried on by S. I. Žegalov, P. I. Lisicyn, V. N. Hohlov and a number of others, working with clover, rye, cereals and other field crops, and by N. N. Timofeev, G. D. Karpečenko and others on distant hybridization and other problems in the improvement of horticultural plants. From 1932 on, the Mičurin-Lysenko principles began to be applied and hardy tomatoes were bred by growing the seed at low temperatures.

CLIFTON, C. E., RAFFEL, S. & STANIER, R. Y. (Editors)
Annual review of microbiology. Volume 9.
Annual Reviews, Inc., Stanford, California, USA 1955 : $7.00 : Pp. ix + 426 : figs. : tables.

The ninth volume of this series (cf. *PBA*, Vol. XXV, p. 104) opens with a paper on Taxonomy, concentrating upon problems of bacterial nomenclature. This is followed by Morphology of viruses by F. B. Bang. Like its predecessor, this issue contains a survey of investigations on the genetics of microorganisms, contributed this time by M. R. Zelle, who, carrying on from the

previous survey by S. Spiegelman and O. E. Landman, examines the literature that has appeared during 1954. Confronted with a formidable total of over 800 references he has chosen 475 and profitably followed the broad approach used in the review for the previous year. Three papers may be found useful reading in conjunction with this survey of microbial genetics: Growth of bacteria by A. Novick, focussing upon continuous culturing techniques and the theory underlying such methods; Nutrition of microorganisms by E. L. R. Svokstad, H. P. Broquist and N. H. Sloane; and Metabolism of microorganisms by E. A. Delwiche. In Fungus infection of plants, C. J. Eide reviews investigations on factors affecting penetration and infection, referring to many pathogens and hosts of economic importance. The remaining nine papers are concerned with topics primarily of significance in medicine or food technology. One of these, by H. Eagle and A. K. Saz, deals with Antibiotics and includes a section on variation in bacterial resistance.

SMITH, K. M. & LAUFFER, M. A. (Editors)
Advances in virus research. Volume II.
Academic Books Ltd., London 1954 : $7.00 : Pp. x + 313 : figs. : tables.

The second volume in this series (cf. *PBA*, Vol. XXV, p. 634) starts with a review by F. O. Holmes on Inheritance of resistance to viral diseases in plants, in which some representative cases of controlling a virus disease by breeding resistant varieties are analysed. The first is spinach blight caused by the cucumber mosaic virus, *Marmor cucumeris*, resistance to which is controlled by a single dominant gene; other cases are resistance to cucumber mosaic in cucumbers and in musk melons, these resistances being controlled by several genes. Attention is next given to the various types of resistance to tobacco mosaic virus and the genes that control it in tobacco, pepper, *Browallia speciosa* and tomato respectively. Consideration is given next to spotted wilt in tomatoes, mosaic diseases in beans, curly top in beets, mosaic in sugar cane and the many virus diseases that attack potatoes. Various special problems met in breeding for virus resistance are analysed, including linkages, effects on nutritional and other qualities and loss of resistance genes during cultivation. It is shown that populations of supposedly susceptible varieties may occasionally contain a few resistant individuals and the search for these in a number of crop plants might well repay the effort. Consideration is also given to the possibility of inducing such variation artificially.

The next contribution is on Inhibitors and plant viruses, by F. C. Bawden, in which various substances contained in higher plants, sera, antisera, certain enzymes and growth products of many bacteria and fungi are shown to be capable of inhibiting infection by viruses and the possible mechanism of this inhibition is discussed. Certain other substances have the effect of inhibiting the multiplication of the virus within infected cells but since the metabolic system of the virus seems to depend on that of the host, not much probability is envisaged of finding an agent that affects one and not the other, at least in the case of the smaller viruses.

E. Pollard writes on The action of ionizing radiation on viruses; he first of all examines the physical action of different kinds of radiation and their effects on large molecules, with a consideration of the target theory; new evidence is presented which leads to a modified version of Lea's hypothesis, namely that ionizing radiation acts on molecular units in such a way that they lose their function if an energy release of sufficient size takes place anywhere inside the molecule. The action of the radiations on the viruses themselves is next analysed and it is seen that the effect is to inactivate a part of the virus, showing it therefore to have a substructure. Studies of bacteriophage have shown the tail to be insensitive, as is also the outer protein shell and the general picture arrived at is that the sensitive volume consists of a coiled-up spiral in the head, so coiled as to form a flat, rather thick plate, either in one unit or as an aggregate of two or three. The evidence does not support the assumption of a direct proportionality between radiation sensitivity and nucleic acid content.

The chemical constitution of viruses is examined by C. A. Knight, who shows that differences in protein composition can accompany mutation of a virus; the differences may be in the proportion of the different aminoacids or in their type, mutants being known which contain aminoacids not present in the original virus; it has however not been possible so far to correlate differences in protein composition with biological properties; the reactive groups in virus proteins are, it seems, essentially the same as those of other proteins; and various groups, including aminoacids, can be added or removed from the viral protein without altering its biological activity. The nucleic acids of different viruses often show

clear differences in composition but in this respect too, different strains of the same virus seem to be identical, so that reservation is expressed regarding the possibility of linking up the biological properties of a virus with the composition of its nucleic acids. The suggestion is put forward that the role of the nucleic acid may be rather "to hold the protein in a specific configuration in which its several biological properties are made manifest."

A useful historical account of investigations on the structure of viruses is given by R. C. Williams in Electron microscopy of viruses, in which the great advances that have been made possible by this new technique are shown clearly and some very fine photomicrographs of a number of viruses are reproduced.

M. A. Lauffer and I. J. Bendet write on The hydration of viruses; the remaining contributions in the volume deal with animal viruses.

KAPPERT, H. & RUDORF, W. (Editors)
Handbuch der Pflanzenzüchtung.
(Manual of plant breeding).
Paul Parey, Berlin & Hamburg 1955 : 2nd Ed. : Lief. 3 : Vol. 2 : Bogen 1–5 : 1–80; Lief. 4 : Vol. 1 : Bogen 11–15 : 161–240; Lief. 5 : Vol. 1 : Bogen 16–20 : 241–320 : figs. : tables : DM 13.50.

The third instalment (cf. p. 129) contains the first part of Band II Getreide-Züchtung [Cereal breeding]. The section on general principles, by the late T. Roemer, slightly reedited by F. Wienhues, is followed by the beginning of Roggen (*Secale cereale*) [Rye (*S. cereale*)] by W. Laube and F. Quadt. The fourth instalment completes the section on cytoplasmic inheritance by P. Michaelis and continues with Populationsgenetik [Population genetics] by F. G. Brieger and Entwicklungsphysiologische Grundlagen der Pflanzenzüchtung [Developmental physiological bases of plant breeding] by W. Rudorf. This is continued in the fifth instalment and includes a detailed consideration of the phenomena of vernalization and photoperiodism. Instalment five also contains the beginning of Stoffproduktion and Pflanzenzüchtung [Assimilation and plant breeding] by P. Schwarze.

SINSKAJA, E. N. (Editor)
(Cultivated flora of the USSR. XIII. Perennial herbaceous legumes. Vol. I. Lucerne, sweet clover and fenugreek).
Gosudarstvennoe Izdateljstvo Seljskohozjaĭstvennoĭ Literatury, Moskva-Leningrad 1950 : 17 r. 50 k. : Pp. 526 : figs. : tables. [Russian].

This is the first volume of the Cultivated Flora of the USSR to be issued since the war and represents somewhat of a departure from the form adopted in the pre-war volumes. It is no longer a mere flora in the strict sense but contains extensive general sections dealing with the biology of development, physiology and phylogeny of the plants in question. A number of separate authors have contributed to the section on lucerne, each dealing with a different aspect. The first is a general survey of the genus *Medicago* by E. N. Sinskaja herself, who describes the characteristics of the genus, the subgenus *Falcago* and the species comprising it, with a general dissertation upon the principles of classification and the nature of the various taxonomic categories such a species, subspecies, cenospecies, conspecies, ecotype and form. The category *varietas* is discarded as being insufficiently precise. The diploid species *M. hemicycla*, *M. coerulea*, and *M. trautvetteri* ($2n = 16$) are included in one cenospecies, the tetraploids *M. glutinosa*, *M. sativa* and *M. falcata* in another and these, together with the diploid *M. quasifalcata*, all together comprise a cenospecies of the second order. *M. hemicycla* is regarded as the most primitive species, which combines features characteristic of *M. sativa*, *M. falcata* and certain other species and is probably a relic of the original *M. praehemicycla* which covered an area extending over the whole of the Caucasus, Afghanistan and Central Asia; the most primitive forms of *M. hemicycla* have been preserved in the Caucasus; they have features in common with the tetraploid *M. tianshanica* and are probably closely related to the diploid ancestor of this species. The tetraploid *M. glutinosa* of the Caucasus is also primitive; it crosses with *M. hemicycla* and is regarded as a probable derivative of *M. praehemicycla*. It is regarded as a possible ancestor of the tetraploid forms of *M. falcata*, which themselves show clear relationships with many of the Asiatic species related to *M. tianshanica*. It is possible that *M. dzhawakhetica* may be a relic of a primitive form combining the characters of *M. hemicycla* and *M. glutinosa*. On the other hand *M. daghestanica* represents an intermediate between the species of the primitive subgenus *Falcago* and those of the subgenus *Spirocarpos* and may even be an interspecific hybrid.

Many species are linked to others by a series of intermediates showing clinal variation in respect of both morphological and physiological characters and the opinion is expressed that the upland forms of the Near East, characterized by a long vernalization stage, have given rise to the Mediterranean and other lowland lucernes with

a short vernalization stage, which differ from the former in a whole series of morphological as well as biological features and have been separated as distinct species.

A key is provided for the identification of the main species of *Medicago* occurring in the USSR and this is followed by a full description of the collective species *M. sativa* and of the species comprising it; these include the ancient lucernes of the Near East, established as a new combination *M. praesativa* Sinsk., hardy, perennial forms with a long vernalization stage, the Mediterranean species and the European species, referred to as *M. eusativa*; next come the Asiatic species, followed by the conspecies *M. falcata*, followed in turn by *M. hemicycla, M. coerulea, M. trautvetteri, M. tianshanica, M. glutinosa* and a number of smaller species. Information is then given concerning resistance to diseases and pests, anatomical and biological features, chemical composition and genetical relationships; under this last head data are given showing which species will cross, the degree of fertility of their offspring and their time of flowering. The Mediterranean species are characteristic in giving heterosis for early flowering in their hybrids, particularly in crosses with Central Asian ecotypes; certain other combinations gave hybrids which flowered at the same time as the earlier parent and a few, particularly those involving Asiatic ecotypes, flowered later than the earlier parent. Many of the hybrids also displayed heterosis for height of plant. Tripolitanian ecotypes showed a particularly strong tendency to produce heterosis in respect of both earliness and height and Asiatic ecotypes showed the least; in hay yield most hybrids between ecotypes were either equal to the higher-yielding parent or surpassed it; some combinations showed a yield increase of as much as 131% and again the greatest increases were observed in hybrids from the Tripolitanian ecotypes. The same applied to heterosis in respect of seed production. Data are given on the characters most often found to behave as dominants in hybrids between ecotypes; more often than not resistance to unfavourable conditions and to pests and diseases behaved as dominant and in all cases the ecotypes regarded on other grounds as the more primitive proved dominant to those regarded as phylogenetically more recent: the most dominant of all were the mountain lucernes, wild and cultivated, of Armenia, classed by Sinskaja in the series *Praesativae*, which she regards as the ancestor both of series *Europaeae* and *Praecocissimae*. Next in order of dominance is series *Euasiaticae*, including the Kašgar ecotype, then southern European ecotypes of the series *Europaeae*; these are followed by series *Praecocissimae* and finally series *Euafghanicae*. When the ecotypes are arranged according to the length of their light stage in vernalization they come into the same order and this seems to be one of the principal features determining the degree of dominance.

The greatest agronomic interest attaches to the hybrids between conspecies *M. sativa* and various races of *M. falcata*; hybrids of *M. sativa* with *M. glutinosa* are less close to the cultivated type but are still more fertile and some of them are of interest for their resistance to wilt and other diseases, particularly those from *M. glutinosa* ssp. *praefalcata*. In these crosses clear differences were observed between the reciprocal hybrids, those in which *M. glutinosa* was the seed parent showing greater resemblances to that species in disease resistance and other characters. No hybrids have yet been obtained between cultivated lucerne and *M. hemicycla* but numerous natural hybrids between *M. hemicycla* and *M. glutinosa* have been found in Dagestan. *M. quasifalcata* is very difficult to cross with cultivated lucerne but by pollinating it with a mixture of pollen from *M. orientalis* ssp. *graeca* three hybrid plants were obtained; one of them was a triploid, intermediate in characters, and produced no seed, while the other two were tetraploid and fertile. Similar results were obtained on pollinating *M. coerulea* ssp. *infradaghestanica* with a pollen mixture from *M. sativa*, two hybrids being triploid and sterile, one tetraploid and fertile, and in a number of other difficult crosses in which pollination has been performed with mixed pollen.

Information is given on the number of archesporia per ovule in the different species and on the biology of fertilization, pollen characteristics and the factors that influence pollination and seed yield. It is pointed out that the Yemen ecotype and certain wild species, including *M. glutinosa*, are distinguished by unusually high seed yields and should be employed in breeding work to improve the seed-producing capacities of the cultivated lucernes, at present one of their most serious defects. *M. scutellata* is mentioned as being both early and a prolific seed producer, *M. coerulea* and related species as drought resistant and the Armenian *M. praesativa* as having strongly-developed root systems.

The section on lucerne terminates with descriptions of the 47 varieties of lucerne authorized

for cultivation in the different zones of the Soviet Union.

The section on sweet clover is arranged on lines similar to that on lucerne. The evolution of the genus *Melilotus* is envisaged as having proceeded in two directions, giving rise to two subgenera, *Eumelilotus* on the eastern side of the Caspian Sea and *Micromelilotus* on the western; when the Caspian Sea diminished in area in the Quaternary period the two subgenera came together and by hybridization gave rise to a third, *Macromelilotus*. The species comprising *Eumelilotus*, viz. *M. albus*, *M. officinalis*, *M. suaveolens* and *M. dentatus*, have in recent times extended considerably westwards, whereas the 8 species of *Micromelilotus* remain confined to the warm humid climate of the Mediterranean basin, except *M. indicus* which has migrated into Asia; those of *Macromelilotus* are confined to the Volga region. The Mediterranean subgenus *Micromelilotus* is regarded, in spite of its smaller area, as the most primitive and within it *M. italicus* as the most primitive species. A new system of classification of the genus has been devised, comprising 9 series, 2 in *Eumelilotus*, 2 in *Macromelilotus* and 5 in *Micromelilotus*. A key for the identification of the species is provided and the species are described, with their subspecies, ecotypes and forms. Data are given on phasic development and germination. *M. officinalis* is said to be the hardiest species and *M. albus*, *M. suaveolens*, *M. wolgicus* and *M. caspius* are also mentioned for the hardiness of some of their forms; these include variety 1146 of *M. albus* bred by the Veselyĭ Podol station and another bred by the Omsk station. Wild forms of *M. officinalis* from Kazahstan and the Volga basin are hardy and forms of these two species combining earliness and winter hardiness have been found in western Siberia and the Caucasus respectively. The most tolerant of drought are the ecotypes with a long growing period, found in southern Kazahstan and the lower Volga basin, and the Indian annual forms. By selection in *M. albus*, biennial forms have been produced which have a very much less extended period of flowering and fruit formation and are therefore easier to harvest. The earliest flowering among the biennial forms is found in *M. hirsutus*, *M. tauricus* and *M. altissimus*, in which the vegetation period is 75–82 days; the latest (127–135 days) is *M. caspius*; the earliest forms of *M. albus* are the ecotypes from the Leningrad and other northerly regions, one of which matured in 77 days in the second year of growth. The earliest annual forms are the Indian, which mature in 50 days; no perennial species have been observed at all in the genus *Melilotus* and among species such as *M. albus*, *M. officinalis* and *M. suaveolens*, normally regarded as biennial, a certain number of annual forms have been found.

Information is given on flowering, self fertility and sterility in the different species, on their anatomical characters and chromosome number; the number $2n = 16$ was found in *M. albus*, *M. officinalis*, *M. wolgicus*, *M. hirsutus*, *M. dentatus*, *M. tauricus*, *M. indicus* and *M. sulcatus*, as well as in the lucerne-like type of *M. albus* and in interspecific hybrids. The opinions expressed by Kirk that the dwarf forms of *M. albus* are mutations or hybrids with lucerne are both considered to be incorrect. Very few seeds were obtained from over 20,000 flowers pollinated in interspecific crosses, the only hybrids obtained being *M. albus* x *M. officinalis*; the reciprocal hybrids differed, displaying in each case a greater resemblance to the species serving as seed parent.

The main diseases and pests attacking sweet clover are enumerated; relatively high resistance to *Erysiphe communis* has been found in certain wild forms of *M. albus* and *M. officinalis*, particularly in ecotypes from the steppes of Kazahstan, the Ukraine and elsewhere. *M. caspius* and *M. tauricus* seem to be immune from *Sclerotinia trifoliorum* and these two species together with *M. wolgicus* have not so far been attacked by wilt, some uncertainty being expressed as to whether this disease is caused by bacteria or by *Fusarium* sp.; *M. dentatus* and *M. suaveolens* are the species least attacked by weevils; *M. dentatus* is extremely tolerant of soil salinity, followed by *M. albus* and *M. wolgicus*, and *M. caspius* grows well on sandy soils. No grounds are found for considering the protein content of *M. suaveolens* as lower than that of other species and a figure of 22·3% is given. An analysis of the available data on coumarin leads to the conclusion that the amounts present in most sweet clovers are not such as to cause any serious injury to stock when fed in the normal way. Figures from large numbers of analyses show the coumarin content to be greatest in *M. albus* (from 0·140 to 1·410%) and *M. officinalis* (0·226 to 1·110%) and low in *M. dentatus* and *M. sulcatus*, some forms of which had only 0·050 to 0·33%. Contrary to the findings of Kirk, variation in coumarin content was observed not only between species but between individuals within every species. Steppe ecotypes of *M. albus* and *M. officinalis* had higher contents than those from northerly areas or more humid climates. The

leaves and seeds have somewhat lower contents than the flowers and higher than the stems but variations from plant to plant are parallel in all organs and selection for coumarin content can be carried out on the seeds. By selection for low coumarin, "sweet" forms with only 0·03% have now been isolated. In an outline of the breeding work that has been carried out with sweet clover in the USSR it is affirmed that insufficient attention has been given to use of the rich resources of local material that exist in the Soviet Union. Examination of extensive collections of this material and of introductions from other countries has shown the range of variation to be much greater than had been supposed, not only in *M. albus* and *M. officinalis* but in the other species too. In 1931 among some Siberian specimens of biennial *M. albus* certain plants were observed to be shorter, more bushy and to have thinner stems, smaller leaves and shorter inflorescences; from their progeny a number of selections were made and these have given rise to the "lucerne-like" sweet-clover strains, so called because of their bushy habit, with up to 100 stems all roughly equal in length; they are very leafy, rarely exceed 100 cm. in height, are quick-growing and early, have a very reduced period of flowering and seed ripening, and have a high protein and low cellulose and coumarin content; the number of stems increases in the second year and the recovery after cutting is quicker and more vigorous than in the common forms; the leaves are small and resemble those of lucerne; the flowers are small and borne on short pedicels. These strains have given satisfactory yields of fodder and of seeds and are promising for hay, as forage plants and as green manure; they are more resistant to cold and virus diseases than the American forms. Attempts to produce hybrids between *Melilotus albus* and *Medicago sativa* have been unsuccessful and no natural hybrids have ever been found; this, together with the fact that the lucerne-like strains have $2n = 16$ as opposed to $2n = 32$ in lucerne, leads to the rejection of the idea that they can be natural hybrids between the two species. Descriptions are given of these and other varieties bred in the Soviet Union.

The smallest section of the flora is that devoted to the genus *Trigonella,* in which *T. foenum-graecum, T. jemenensis, T. gladiata, T. coerulea, T. platycarpos, T. suavissima* and *T. arabica* are described.

Each of the three sections is provided with a bibliography, which is confined however almost exclusively to Russian works. There are also an alphabetical list of Soviet lucerne varieties and separate indexes of Russian and Latin names.

ČMORA, N. JA. & ARNAUTOV, V. V. **(The potato).** (Editors)
Ministerstvo Kuljtury SSSR, Glavizdat, Moskva 1953 : 13 r. 40 k. Pp. 567 : 136 figs. : tables. [Russian].

This monograph on the potato has been compiled jointly by the staff of the Potato Research Institute at Korenevo, near Moscow, each member having contributed a chapter or a section. Starting with general accounts of the present-day importance of the potato in the USSR and the history of its development there, it goes on to present descriptions of the potato plant, its anatomical, biochemical and biological features and methods of cultivation. Several chapters are devoted to mechanization of planting, cultivation, harvesting etc., and special mention is made of the advantages of planting in squares and of summer planting for the production of healthy seed stock. In the section on seed production much emphasis is laid on the theory of Mičurin and Lysenko concerning the role of environment in changing the hereditary constitution of the progeny. The idea that degeneration can be prevented by protecting the parent plants from virus diseases is described as "obviously scholastic and false" and figures are given to show that tubers reproduced in very different ecological conditions generally gave rise to plants with lower yields than those from tubers reproduced locally, although exceptions were also noted. Figures are also given to illustrate the value of roguing and of positive selection for plant and tuber type in improving the yield and health of the succeeding crop and precise directions are given as to how to handle a crop of potatoes designed for producing seed.

A chapter is devoted to brief descriptions of all the main varieties grown in the Soviet Union, with illustrations and indications of their regional distribution, and a whole section to potato breeding; an account is given of the work of the Korenevo station, which released the first two Soviet varieties, Lorh and Korenevskiĭ, in 1929. Wild species were first used in 1926, when the first crosses between the variety Granat [Pomegranate] and *Solanum demissum* were made; back crossing the hybrids with Granat led to the production of the variety Narodnyĭ [People's] and the blight-resistant variety 8670–S/31, later known as Fitoftoraustoĭčivyĭ [Blight-resistant], which was also resistant to

wart and 3–4° C. of frost. Extensive use of the collection of potatoes from Central and South America showed the extreme complexity of the problems of breeding improved varieties in this way and after 1948 the Mičurin-Lysenko theory was applied; the new varieties evolved by the many research stations working with potatoes in the different parts of the USSR are enumerated; they contain one or two that have been produced by vegetative hybridization but it is stated that the scientific basis of this method needs further elucidation before it can replace the method of sexual hybridization. Special emphasis is laid on the impressionable nature of young seedlings, which are subjected to selection for desired qualities before they have acquired hereditary conservatism from successive generations of clonal reproduction. Since hereditary differences exist, it is claimed, between different tissues in the tuber and between shoots developing from different eyes at different periods of time, selection among the shoots from a single tuber may also lead to positive results. The principle of pollen mixtures in permitting the seed parent to exercise selective fertilization, so avoiding excessive segregation and producing a more adapted progeny, is expounded. The application of vegetative rapprochement, mentors and other Mičurinist techniques has made it possible to overcome the sterility which had previously presented an obstacle in making certain interspecific crosses. In this way it has been possible to make crosses of *S. punae*, *S. schreiteri* and *S. semidemissum* with domestic potatoes of the varieties Smyslovskiĭ (= Fürstenkrone), Katahdin and others, from which crosses blight-resistant hybrids of good commercial quality have been developed. In the same way crosses have been made with *S. gibberulosum*, *S. parodii*, *S. schickii*, *S. schreiteri* and *S. jamesii*. The characters of the wild species were less dominant in the hybrids when seedling plants were used for crossing, rather than clonal plants.

Of the 62 Soviet potato varieties released since 1920 some 50% have been derived from Smyslovskiĭ and a much lower proportion from Epicure, Early Rose and Jubel; those varieties considered best for use as parents in breeding for yield, starch content, earliness, flavour, tuber shape and resistance to drought, wart and blight are enumerated. Several wild species are recommended for breeding for resistance to frost and late blight, *S. jamesii* for breeding for resistance to degeneration, wart, Colorado beetle and drought, *S. rybinii*, *S. kesselbrenneri* and *S. boyacense* for short dormancy and *S. commersonii* and *S. vavilovii* for prolonged dormancy; brief descriptions are given of the main species of *Solanum* thought to be of interest for breeding purposes. *S. andigenum* ff. *tocanum*, *tolucanum*, *pacus*, and *quechuanum* are mentioned among those that produce high-yielding hybrids in crosses with domestic potatoes; ff. *herrerae*, *cuzcoense*, *tolucanum* and *hederiforme* are mentioned as giving hybrids with high starch content and suitable domestic varieties for crossing for the same purpose are indicated; *S. curtilobum*, *S. demissum*, *S. semidemissum*, *S. verrucosum* and *S. punae* are mentioned for their high starch content. Special reference is made to the achievements of Soviet potato breeders in producing early varieties such as Ėpron, which is also good in yield and disease resistance, Jubileĭnyĭ [Jubilee] and Oktjabrenok [Little Octobrist], which are promising for the South-east, and Sovetskiĭ, which is high in yield and starch content; back crossing has played an important part in this, as in so many other Soviet breeding projects. Crosses with *S. andigenum* f. *tocanum* and others have given rise to some good early hybrids and *S. boyacense*, *S. rybinii*, *S. demissum*, *S. semidemissum* and other wild species are thought to be promising in the same respect. One of the best parents for breeding wart-resistant varieties is Jubel, also Parnassia and Courier, but resistant seedlings have also been obtained from crosses between two susceptible parents; many of the South American potatoes are wart resistant too. Smyslovskiĭ, Courier and Jubel are mentioned among the most drought-resistant in domestic varieties and *S. leptostigma*, *S. molinae* and *S. parodii* among the wild species. For freedom from degeneration *S. leptostigma*, *S. molinae*, *S. emmeae*, *S. parodii* and *S. laplaticum* are mentioned, for scab resistance the variety Jubel and *S. commersonii* and *S. jamesii*, for resistance to *Corynebacterium sepedonicum* Lorh and Wohltmann, and for resistance to *Fusarium* Katahdin. *S. antipoviczii* is mentioned as having a high content of vitamin C. Tubers with up to 2·5% of protein have been found in hybrids from *S. semidemissum*.

Experience has shown that the best chances of obtaining high-yielding blight-resistant hybrids in crosses of *S. demissum* are from crossing the first back-cross generation with suitable cultivated varieties, by which means as many as 50% of desirable seedlings may be obtained; good results have also been obtained by crossing the back crosses among themselves. Hybrids of *S. semidemissum* with domestic varieties have now been obtained and some of them combine

resistance to blight and frost; they have less of the wild characters and seem slightly less prone to degeneration than the *S. demissum* hybrids. Promising seedlings have been obtained both by back crossing and by crossing the hybrids among themselves and the best of them have exceeded Lorh in yield of tubers. Attempts to breed blight-resistant forms by crossing with *S. antipoviczii* and other species have not so far been successful. F_1 hybrids of *S. schreiteri* and *S. punae* with Smyslovskiĭ tolerate frosts of −5° C. and although in general resistance became progressively less with back crossing, a few promising frost-resistant seedlings yielding up to 1240 g. per plant have been obtained; however when they were grown in hot frames or greenhouses for tuber reproduction they tended to lose their hardiness, which could be maintained only when the tubers were multiplied under suitable conditions where the temperature did not rise above 3° C. Frost-resistant hybrids have been obtained from *S. semidemissum* as well as the species mentioned above. The belief is expressed that it will be possible to produce potatoes resistant to Colorado beetle too by the application of Mičurinist techniques. The principle of vegetative hybridization is expounded in a special section, based on the writings of Darwin, Timirjazev, Mičurin, Lysenko, Gluščenko and others; experiments are reported in which scions of *S. punae* grafted on to domestic varieties displayed increases in chromosome number and root stocks of *S. demissum* on which domestic varieties were grafted showed reductions in chromosome number from 72 to 48; no morphological difference was observed between those sections with changed and those with normal chromosome number. Changes recorded in the second and later tuber generations from grafted plants include resistance to −4° C. in tubers from scions of Early Rose doubly grafted on to *S. schreiteri*, together with morphological changes that have persisted for 12 tuber generations; three promising varieties have been produced from crosses of these graft progenies with blight-resistant and other domestic varieties. Earlier maturity has been induced in the tuber progeny of late varieties by grafting early forms on them and promising early seedlings have been obtained by crossing the resulting plants with some of the interspecific hybrids. Improvements in blight resistance, starch content, drought resistance and yielding capacity are also reported from the tuber progenies of grafted plants, and details are given of the methods used in grafting. The opinion is expressed that the influence of environment is just as important in determining the success of breeding operations as the genetic constitution of the parents and that neglect of this principle has led breeders to rely too much on large numbers of seedlings to ensure success; maintaining a high level of fertility in the breeding plots, it is maintained, is just as important. Improvements of 10% and more in the variety Narodnyĭ in respect of yield are cited as a consequence of tuber selection; hence clonal selection, consisting in selecting the plants with the best yield of healthy tubers and multiplying the tubers of each plant separately, is strongly recommended as a method of potato improvement; the selection is repeated over a number of successive years, the tubers of each clone being kept together and unhealthy clones being discarded. Some of the improved clones described are stated to have outyielded Lorh by up to 80%, giving up to 2525 g. of tubers per plant.

Information is given on the techniques employed for assessing resistance to frost, drought and various diseases and the system of testing new varieties is described. Six-fold replications are recommended, with 25–45 plants in each replication. An account is given of the equipment used in potato breeding, such as greenhouses, hot frames, selection plots and storage chambers. The technique of hybridization and of raising and examining seedlings is described and an account is given of the main diseases and pests of the potato, of their life cycles, the symptoms they produce and the methods of controlling them. A final chapter deals with storage.

Bukasov, S. M. & Kameraz, A. Ja. (**Potato breeding**). Ogiz-Seljhozgiz, Moscow-Leningrad 1948 : 7 r. 35 k. : Pp. 359 : figs. : tables. [Russian].

Prof. S. M. Bukasov was one of the botanists who took part in the famous collecting expeditions sent by the Soviet Union in 1925 and succeeding years to South America and has been personally responsible for the Soviet potato collection since that time. He has published a large number of scientific articles dealing with the potatoes of Central and South America but the volume under review is the only book he has written exclusively on the subject of potato breeding.

The first chapter gives an historical outline of the results of potato breeding in the USSR, starting with the production by the Institute of Plant Industry and its dependent stations of varieties such as Lorh, Korenevskiĭ, Sovetskiĭ, Moskovskiĭ and Kollektivnyĭ by intervarietal

crossing within *Solanum tuberosum*. Special mention is made of the early variety Epron, a hybrid of Epicure x Alma, distinguished by unusually high yield. Interspecific crossing was started in 1933 and led to the production of the varieties Granat [Pomegranate], Narodnyĭ [People's] and Fitoftoraustoĭčivyĭ 8670 [Blight-resistant 8670] and Kameraz 1, 2, 3, etc. from crosses with *S. demissum*. Some useful blight-resistant hybrids have been produced also from crosses with *S. semidemissum*. A frost-resistant hybrid was bred from Epicure x *S. curtilobum*; blight-resistant varieties raised during the war from *S. demissum* crosses include Krasnoufimskiĭ and Uraljskiĭ. Early varieties suitable for the extreme north include Murmanskiĭ from crosses within *S. tuberosum*, and several hybrids of *S. andigenum* such as Imandra, Sestra Imandry [Imandra's Sister], Poljarnik [Polar], Umptek and Poljarnaja Roza [Polar Rose]. Of these Imandra (Jubel x *S. andigenum* f. *tocanum*) is immune to the new aggressive races of wart. Varieties without dormancy capable of giving two yields of tubers a year, bred from crosses of *S. boyacense*, include Hibinskaja Skorospelaja [Hibiny Early] and Hibinskaja Dvuhurožaĭnyĭ [Hibiny Double-crop]; they are suitable for growing in Central Asia and the Black Sea area. Promising varieties produced by other stations include Podarok Rodine [Present to the Fatherland] and Novinka Pustyni [Desert Novelty], bred at the Priaraljskaja station from *S. tuberosum* crosses and suitable for the Taškent area in Uzbekistan; two Chilean varieties that have proved free from degeneration when grown in Central Asia; Seedling 74, a popular variety bred at the Leningrad station from Epicure x Centifolia; varieties 15555, 15627 and 15698, wart-resistant hybrids of *S. andigenum*, and blight-resistant Seedling 1611, all bred at the Moscow station; seedlings of early potatoes that outyield Epron by 30–80% in the Ukraine; the early variety Oktjabrenok [Little Octobrist], with high starch yield, from Smyslovskiĭ (= Fürstenkrone) x Asa; Hybrid 42, a complex hybrid distinguished by earliness, resistance to wart and blight and high starch content bred at the Uljjanov station; and seedlings 96 and 101, bred from *S. andigenum* crosses and outyielding other varieties in the extreme north.

Special attention is being given to the production of interspecific hybrids that may possess resistance to Colorado beetle and other pests, the species being used for this purpose being those of the group *Commersoniana*.

A list of 21 of the best Soviet varieties is given, with indications of their origin.

Historical outlines of potato breeding in Great Britain, the USA, Germany and other European countries include indications of the varieties from these countries which have played the most important part in potato breeding in the Soviet Union, their degree of fertility, disease resistance, earliness and other qualities.

Chapter II deals with the introduction of the potato into Europe and elsewhere and with the South and Central American potatoes as they have become known through Soviet and later expeditions. The geographical distribution of the species is discussed and emphasis is laid on the wide difference in ecological conditions between the areas of the Chilean species, referred to as *Eu-tuberosa*, on the one hand and the Andean species, *Andigena*, on the other and on their geographical isolation one from the other, and suggestions that *S. tuberosum* and *S. andigenum* are identical are rejected. *S. tuberosum* is regarded as being derived from the wild Chilean species, such as *S. leptostigma* and *S. molinae*, and their hybrids whereas *S. andigenum* is more closely related to the diploid Andean species *S. ajanhuiri*, *S. phureja*, *S. stenotomum*, *S. goniocalyx* and the *S. rybinii* group; each of these is thought to be derived from a different wild species and *S. andigenum* itself is regarded as in all probability polyphyletic, having arisen from several wild diploids in different places, or from tetraploid species such as *S. herrerae* and *S. subandigenum*; their further hybridization has given rise to triploid species such as *S. chaucha*, *S. tenuifilamentum*, *S. chocclo* and *S. cuencanum*. The triploid *S. juzepczukii* probably arose by crossing of *S. ajanhuiri* or *S. stenotomum* with wild species of the group *Acaulia*. Since *S. acaule* is almost exclusively self pollinated and weed forms of it occur mainly with *S. juzepczukii* or *S. andigenum*, the suggestion of Hawkes that *S. juzepczukii* arises constantly by crossing between *S. acaule* and cultivated potatoes is considered improbable but at least the species is regarded as polyphyletic. The group *Oxycarpa* is considered artificial on geographical grounds and should be divided into *Conicibaccata*, comprising South American species, and *Oxycarpa* comprising *S. oxycarpum* and other Mexican species. A chart is presented showing the distribution of 155 wild species in Central and South America and another arranges all species, cultivated and wild, according to geographical area, systematic position and chromosome number.

The various characters which determine the agronomic value of a potato variety are analysed in Chapter III; these include tuber size,

conformation and colour, growth habit, wart resistance and earliness; indications are given of suitable parental varieties for breeding for earliness and tuber size, it being pointed out however that certain characters may appear in the progeny of a cross in which neither of the parents possessed them, as in the case of blight resistance in crosses of *S. acaule* x *S. tuberosum* and *S. tuberosum* x *S. andigenum*. Attention is drawn to the high yielding ability of certain forms of *S. andigenum* and their hybrids; those from Colombia and Ecuador have the best tuber shape and quality, *S. andigenum* f. *tocanum* being specially mentioned in this respect.

Chapters IV to X deal with breeding for particular qualities. Information is given regarding the dry-matter content of the different species, some of which have up to 36·7%; starch contents exceeding those of the standard domestic potatoes have been found in some forms of *S. andigenum* and in their hybrids, such as Imandra; in hybrids of Epicure x *S. rybinii* a starch content of about 16% has been recorded and crossing with *S. curtilobum* has raised the starch content by 5% without loss in yield. High starch content has been observed also in hybrids of *S. demissum* and *S. leptostigma*. However, a sharp fall often occurs in the following generations and the increases are thought to result partly from heterosis. The largest starch grains have been found in *S. dolichostigma* and *S. tuberosum* vars. *villaroela* and *recurvatum* and in certain hybrids, e.g. *S. andigenum* var. *tocanum* x Fürstenkrone and Epicure x *S. longibaccatum*. Information is given on the starch content of many varieties of domestic potato.

The highest protein contents were found in *S. phureja, S. semidemissum, S. demissum* and some forms of *S. andigenum*, all of which have over 4%. In crosses the high protein content of the *S. andigenum* lines often behaves as a recessive character, that of *S. demissum* as a dominant. The occurrence of certain wild potatoes such as *S. antipoviczii* and some species in *Acaulia*, in which the haulms are free from solanin, leads to the suggestion that forage potatoes with edible tops might be bred. Some of the *S. andigenum* hybrids, such as Imandra and Sestra Imandry, are distinguished by superior tuber flavour. The highest content of vitamin C is reported in *S. antipoviczii*, which has 22·0 mg.%. *S. punae* and *S. schreiteri* in section *Acaulia* resist frosts of −8° C. at Leningrad and some of the species of *Commersoniana* (*S. henryi, S. mechongense, S. commersonii, S. millanii* etc.) are almost equally resistant; lesser degrees of frost resistance can be found in other species such as *S. curtilobum* and *S. andigenum*, and hybrids of *S. andigenum* have been produced which resist −3° C. and are equal to domestic varieties in yield. Hybrids with species of the *Acaulia* group have generally shown a marked reduction in frost resistance in back crosses with *S. tuberosum* and it is thought that this may be connected with their tendency to form unreduced gametes; contrary to expectation, hybrids of *S. punae* x Fürstenkrone proved resistant to *Phytophthora infestans* and may therefore be of value in producing hardy blight-resistant forms. Drought resistance is found in the Chilean *S. leptostigma* and under conditions of irrigation *S. molinae* withstands high temperatures; hybrids of Jubel, Parnassia and other domestic varieties with *S. molinae* have given yields of 1000–1800 g. in hot years. In breeding for earliness, yields should be tested in denser stands than those used for later varieties; several high-yielding early hybrids have been obtained by crossing *S. andigenum* with domestic varieties such as Centifolia or Fürstenkrone. Species of the group *Rybiniana*, such as *S. boyacense, S. rybinii* and *S. kesselbrenneri*, as well as *S. phureja*, have given promising hybrids whose tubers germinate without dormancy; they yield as well as or better than the standard varieties, their starch content is good and in southern parts of the Soviet Union they will produce two and even three crops a year; in the arctic regions they behave as early varieties and give quite satisfactory yields; the *Rybiniana* hybrids are superior in flavour and quite good as regards shape of tuber; yields of up to 156 c. per ha. have been produced by a hybrid of Albabona x *S. boyacense* in the Taškent area and 180 c. per ha. by Brita x *S. boyacense* at Krasnodar. Many of these hybrids have proved to be tetraploids instead of the expected triploids; thus tetraploid hybrids have been produced in the crosses *S. tuberosum* x *S. rybinii, S. rybinii* x *S. tuberosum, S. tuberosum* x *S. phureja* and *S. phureja* x *S. tuberosum* as well as in *S. rybinii* x *S. leptostigma* and in crosses of *S. catarthrum* and *S. gibberulosum* with *S. tuberosum*.

Although wart disease was not present in the USSR before 1940, most of the newer varieties such as Imandra are wart resistant. Data on the reaction of the main species to the common strain of wart show that resistant species occur in all the main groups; the best source of resistance to the more aggressive races is *S. andigenum* and some of its hybrids such as Fram and, apparently, Imandra. In reaction to blight, different forms of *S. demissum*, and even

different hybrids of the same form, may vary from 100% resistant to 100% susceptible; vars. *tlaxpehualcoense* and *xitlense* are among the most resistant and give resistant seedlings. *S. semidemissum* has been crossed with a number of domestic varieties and given rise to blight-resistant seedlings in the back crosses, some of them being characterized by good yield and starch content. *S. demissum* has been crossed successfully with a number of species, which are enumerated. Resistant hybrids have been obtained from a hexaploid form of *S. vallismexici* but most of their back-cross progeny were susceptible. The tetraploid *S. ajuscoense* has been crossed with a number of species, both cultivated and wild, but the progeny have not been promising. *S. antipoviczii* has also been crossed with a number of species; the hybrids with *S. tuberosum* are often resistant to blight but low in quality and even from back crosses with *S. tuberosum* no promising seedlings have so far been obtained. From large numbers of pollinations a few hybrids have been obtained from *S. polyadenium* x *S. tuberosum* and *S. bulbocastanum* x *S. tuberosum*. From an examination of all these various crosses it is concluded that the most promising results in breeding for blight resistance are to be expected from the use of *S. demissum*. In the work at Leningrad 80–100 thousand seedlings from these crosses have been raised annually; tabular data are given on the yielding ability of a number of the hybrids; some of the second back-cross hybrids produce almost 3 kg. of tubers per plant but selfed generations from the back crosses were less productive and some of the best results have been obtained from the third or later back-cross hybrids or from (F_2 *S. demissum* x *S. tuberosum*) x *S. tuberosum* crosses. Starch content is generally higher in the first generation and falls in subsequent ones. The long stolons can generally be overcome only by back crossing; the best tuber shape is found in crosses of the type *S. tuberosum* x (F_2 *S. demissum* x *S. tuberosum*) and hybrids with quite good tuber flavour occur in the later back-cross generations. The various methods of testing seedlings for their reaction to *Ph. infestans* are described. It is found that in most cases plants that display tuber resistance are resistant in the haulm too and all seedlings are tested for tuber reaction before deciding whether to select or discard them. The proportion of resistant plants in the back-cross populations of different types varied with the variety of *S. demissum* and of *S. tuberosum* chosen and with the particular hybrid used for back crossing, up to 49% of seedlings being resistant in the haulm in some progenies even of the later, more complicated, back crosses; a still higher proportion was obtained by crossing the hybrids with one another. Provided the hybrid taken for crossing was resistant in the haulm, its tuber resistance appeared to have little or no influence on the haulm resistance of the progeny but affected its tuber resistance and by a correct choice of parents it is possible to produce hybrids resistant in both tuber and haulm.

Information, some of it in tabular form, is given regarding the effect of a large number of domestic varieties on the yield and quality of the hybrids in crosses with *S. demissum* and on certain other characters such as earliness and wart resistance. Replacing *S. tuberosum* by certain forms of *S. andigenum* in one generation of complex back crosses sometimes increased the yielding capacity of the seedlings but tended to reduce their quality and so complicate the breeding work. The offspring obtained by crossing the hybrids among themselves, though more blight resistant than the back crosses, were also lower in yield and quality. The first blight-resistant variety produced from this work was 8670, bred in 1933 from crossing Narodnyĭ with a hybrid (*S. demissum* x Granat) x Granat; it is also wart resistant but has not proved popular owing to low yield and quality; by crossing it with Alma another blight-resistant hybrid, 18883, was produced and later crosses have led to a whole series of others, which are described. The best of them are equal to the best commercial varieties in yield, starch content and other qualities.

Indications are given of varieties of domestic potato that are homozygous for resistance to several races of scab; resistance has also been found in certain wild potatoes in *Commersoniana*, including specimens of *S. chacoense*, *S. parodii* and *S. jamesii*. Differences between varieties and species have been observed also in respect of resistance to *Spongospora subterranea* and to *Alternaria solani*; most forms of *S. demissum* and its hybrids are susceptible to *A. solani* but some are less so than the rest. At least one form of *S. andigenum* has proved immune from black leg (*Bacterium phytophthorum*) and several others, together with a number of domestic varieties, are resistant.

The chapter on degeneration is contributed by A. I. Rudenko. Data are presented which show the degree of degeneration in several domestic varieties to increase with rising temperature, in consequence of which healthier seed potatoes are produced in the south of the Soviet Union

from summer planting, where the tubers develop in the cool months of the early autumn, than from spring sowing. This phenomenon is considered distinct from the degeneration due to virus diseases; some varieties are enumerated which have displayed resistance to viruses X, A, B and C, either singly or combined, and others which display a necrotic reaction; this latter group contains a number of clones of *S. andigenum* and various other South American species. *S. gibberulosum* has shown signs of being immune from purple-top wilt and certain domestic varieties are also mentioned as resistant. Many hybrids of *S. demissum* are said to be uncommonly prone to brown spot.

Resistance to Colorado beetle has been found in *S. demissum, S. chacoense, S. henryi, S. commersonii, S. millanii, S. parodii, S. jamesii* and *S. polyadenium* and the same species are assumed to be resistant to *Epilachna vigintioctopunctata*, which is becoming serious as a pest of potatoes in the Far East. Certain other species are referred to as being resistant to aphids and to cicadids.

Various forms of vegetative deviations such as bolters, stags, dwarfs, wildings and others are described in the chapter on vegetative selection, in which reference is also made to the experiments of I. E. Gluščenko and to those on clonal selection and vegetative hybridization by T. D. Lysenko and others. In the chapter on sexual hybridization the causes of sterility and methods of overcoming it are discussed; it is noted that most of the wild species of South and Central America are fertile whereas the cultivated diploid species are mostly sterile. The technique of crossing is described and the fertility relationships between 27 of the main species are shown in tabular form. Some general guidance is given for carrying out selection for such characters as drought resistance, winter hardiness, earliness, blight resistance, yield, starch content and other desirable qualities and an outline is given of the system of seed production for potatoes in the USSR. In the closing chapter the authors point out how the use of the large range of species comprising the Leningrad collection illustrates the Mičurin principles of wide crossing and shattered inheritance, followed by training of the offspring by growing them under suitable conditions of soil and climate. A particularly promising future is foreseen for the production of frost-resistant hybrids. The use of vegetative rapprochement for overcoming sterility in interspecific crossing is recommended, since by its means hybrids have been obtained from *S. depexum, S. schreiteri, S. punae, S. antipoviczii* and many species of the *Glabrescenta* subgroup of *Commersoniana*, including those comprising the collective species *S. parodii*. The application of pollen mixtures has also increased the chances of success in wide crosses. Finally, vegetative hybridization is envisaged as another technique whereby improved potato varieties may be produced and a case is quoted in which grafts of *S. punae* on to Ballydoon gave rise to plants displaying all the characteristic features of sexual hybrids of this combination.

There is a certain discrepancy, probably due to joint authorship, in the remarks in different sections of the book concerning certain questions such as the role of chromosome number in affecting fertility and inheritance of characters and on the role of virus diseases in degeneration.

Lorh, A.
(The potato).
Moskovskiĭ Rabočiĭ, Moskva 1955 : unbound 5.80 r.; bound 7.80 r. : Pp. 155 : figs. : plates. [Russian].

Designed primarily for the use of the home gardener or student, this attractively produced monograph supplies the general information one would expect to find in a short text book of this kind. It is written in a lucid style and the main points of each section are recapitulated in the form of questions and answers. The text is supplemented by frequent illustrations and some excellent colour plates. The first section discusses the value of the potato as a food plant and describes the plant, its development and external requirements. The succeeding chapters deal briefly with varieties, the principal pests and diseases and, rather more fully, with agricultural methods. One cannot help feeling that a rather less general treatment would have enhanced the value of the book and also that the chapter on varieties, which is confined to barely five pages, deserves some expansion.

Zaĭceva, N. D. & Trošina, N. P. (Editor)
(The determination of potato varieties).
Gosudarstvennoe Izdateljstvo Seljskohozjaĭstvennoĭ Literatury, Moskva 1950 : 15.00 r. : Pp. 150 : figs. : tables : plates. [Russian].

This attractive and useful reference book has been produced by the Soviet Potato Research Institute. The first section describes the habit and morphological characteristics of the leaf, flower, tuber and partially etiolated sprouts upon which varietal distinctions are based and refers to correlations between some of these characters. Then come descriptions of the

principal Soviet varieties, arranged in alphabetical order (apart from the most recent accessions which are added to the bottom of the list). The descriptions normally mention the origin of a variety, synonyms (if any), resistance to wart and other economic properties and the morphological characters by which it is identified. A complete list of varieties that have been studied is given, together with a key to their determination and a collated identification chart. The value of the book is greatly enhanced by excellent drawings and coloured plates.

CHRISTIDIS [KHRISTIDIS], B. G. & HARRISON, G. J.
Cotton growing problems.
McGraw-Hill Book Company, Inc. New York & London 1955 : 73s. : Pp. vii + 633 : 168 figs. : 72 tables.

Written to provide information for both agricultural scientists in general and for commercial growers of the crop, particularly in the United States, this book provides an excellent up-to-date account of the essentials of the many problems involved in cotton cultivation throughout the world. Prof. Christidis, the senior author, has been responsible for the entire writing of the work, and as director of the Cotton Research Institute, Sindos, Greece, has been able to draw upon the results of experiments in that country and has included many data now published for the first time. The coauthor, Dr. Harrison, formerly principal agronomist, USDA Cotton Field Station, Shafter, Calif., has been responsible for editing the book with regard to the requirements of American readers and has chosen the examples from the United States. Part I deals with varieties and contains one chapter describing at considerable length the characteristics required of profitable commercial varieties, another on breeding and a third on leading varieties in the United States, Egypt and a number of other countries. The remaining eight parts are devoted to crop rotation and soil cultivation, fertilization, the seed, planting, cultural methods, insect pests and diseases and, lastly, harvesting. Bibliographies are given at the chapter ends. Although specialists in any particular field may at times be critical of omissions in the literature referred to, the authors are to be congratulated on the amount of ground covered adequately.

ENDEMANN, W.
Die Tabakpflanze. (**The tobacco plant**).
Die neue Brehm-Bücherei, Wittenberg 1954 : DM 2.25 : Pp. 47 : 13 figs.

It is obviously not possible in so small a book as this to delve very deeply into the vast amount of information that has been amassed on the subject of tobacco. Nevertheless, the present volume integrates into a comprehensive whole many of the aspects concerned with this crop, be they factors related to its cultivation and curing, its effects on the human system or its importance in virus research. After an introductory section on the history, manufacture and use of tobacco the author launches into an account of the different varieties of *Nicotiana*, where they are cultivated and the results achieved by breeding. The influence of external environment, including climatic conditions and methods of cultivation, on the quality of the leaf and the nicotine content of the finished product are also discussed at length. There follows a short description of the more important varieties at present grown in Eastern Germany. Fungous, bacterial and virus diseases to which the crop is susceptible are also discussed.

The scientific information given is necessarily of a somewhat elementary nature but it must be remembered that this is a book intended for the general public, and not for the specialist. As such it makes very interesting reading and the author is to be congratulated on compressing so much information into so short a space.

(The tea plant).
Trudy Sočinskoĭ Opytnoĭ Stancii Subtropičeskih i Južnyh Kuljtur. 1949 : 13 r. : Pp. 310 : figs. : tables. [Russian].

This volume on the tea plant in Russia comprises a series of articles by different authors, each dealing with a different aspect of tea growing in the USSR. The first two contributions contain a general description of the tea plant, as well as a brief account of experiments on growing it in different areas in the North Caucasus; others are devoted to questions of soils, management, manuring, pests, picking and the chemical composition of the product. The last contribution is on Tea breeding by V. A. Evstafjeva, who points out the difficulties caused by the time of flowering of tea plants in the Krasnodar area, where it may occur as late as November and December, when the frosts are often strong enough to prevent seed setting. Experimental plantations of material from various sources have been under observation since 1947 and are being selected for frost resistance, morphological characters and yield of leaf; the selections are then tested further in five different localities. In one place 12,528 bushes out of a total of 15,846 were destroyed by the severe winter of 1946–47, with minimum temperatures of —20·8° C.; some of the survivors

died the following winter in spite of it being relatively mild, possibly as a result of the very dry summer; very few of the bushes survived this and the following, severe, winter. No correlation has been observed between morphological type and frost resistance, some of the hardiest bushes being Chinese types with excellent morphological features. Bushes that had been picked were more severely damaged and it is recommended that selection for frost resistance should be carried out on bushes that have not been picked. The yield of green leaf from the selections varied from 0 to 219 g. per bush, the best being about twice as productive as the unselected controls. The seeds collected were somewhat smaller than those from Georgia, having an average weight of 1·04 g., but germinated well after stratification.

GRÜMMER, G.
Der Mohn. (**The poppy**).
Die neue Brehm-Bücherei, Wittenberg 1955 : DM 2.25 : Pp. 40 : 27 figs.

This short monograph is devoted primarily to the opium poppy, *Papaver somniferum*, but mention is also made of horticultural varieties and of the species *P. rhoeas*, *P. strigosum*, *P. trilobum*, *P. dubium* and *P. argemone*. The author deals firstly with the uses to which the crop and its fruit are put, including the production of oil and narcotics and its value as an ornamental plant. The morphology of the leaves, stalks, flowers and seeds is described in detail and brief descriptions are given of the principal varieties at present grown in Germany for the production of oil. In the section dealing with the agronomic aspect of poppy cultivation and the diseases and pests to which the crop is susceptible mention is made of the possibilities offered by its use in mixed sowings with root crops, especially carrots and mangels. After providing some useful information on the harvesting and processing of the poppy seeds for oil extraction the writer goes on to discuss the chemical composition of the sap of the capsule and the preparation from it of opium and its derivative, morphine. Drug addiction is then dealt with and special reference made to the opium habit in China, the opium wars and the suppression of the opium trade by the present Chinese government.
The author succeeds in presenting an interesting, topical account of the poppy, its cultivation and the uses to which it is put. The work is well illustrated and should serve as a useful introduction to anyone contemplating growing this crop.

WIEDEMANN, E.
Ertragskundliche und waldbauliche Grundlagen der Forstwirtschaft. (**The basis of forestry from the standpoint of attaining high yield and of sylviculture**).
J. D. Sauerländer's Verlag, Frankfurt am Main 1951 : 2nd Ed. : Bound, DM 18.80; Unbound, DM 15 : Pp. 346 : 59 figs. : 47 tables.

German foresters are fortunate in having almost unbroken records for over 70 years of the behaviour of the main forest-tree species in experimental plantations established all over the country. Monographs have been published incorporating the results for some of the main species but the plan to devote a separate monograph to each species was made impossible owing to the loss of material and records during the second world war and this volume gives a more general account of the work of the Preussische Forstliche Versuchsanstalt [Prussian Forestry Research Station], of which the late Professor Dr. E. Wiedemann was one-time Director, during the last 70 years. It was completed just before the author's death and first published in 1951; the second edition is unchanged and begins with a study of the development of individual trees of different species under different soil and other conditions. It is shown that the well-known characteristics of certain local types, though they may be in some ways favoured by the climatic conditions of the locality, are often hereditary and perpetuated when the race is introduced elsewhere, having originated from long years of natural selection and more recently artificial selection by man. In spite of this, considerable differences have been observed in growth rate, vitality etc. between individual trees in the progenies of many races of pine and other trees when carefully studied.
The development of a pure stand and the factors which influence it are analysed, after which consideration is given to various questions of management such as thinning, as they affect the different species, and to various forms of mixed stand. Natural regeneration is discussed in general and in relation to the individual tree species. An account is given of the observations made over 50–100 years on 635 experimental plantations of Douglas fir and other introduced species; Douglas firs from low, coastal areas have done well whereas those introduced from Colorado and areas with continental climates have failed. Species such as *Abies concolor* and *A. grandis* are of interest for their insect

resistance; the Sitka spruce is recommended for areas with high humidity and windy conditions in coastal areas, although in inland areas it is sometimes damaged badly by *Tomicus micans*. Mixed results have been given by Japanese larch, which in many places has proved inferior to *Larix europaea*. Promising results have been obtained with *Pinus strobus* in certain suitable areas, with *Quercus rubra* and to a slightly lesser extent with *Carya alba* and *Acacia* spp. Species thought worthy of further investigation include *Thuja gigantea*, *Chamaecyparis lawsoniana*, pitch pine, American poplars, *Pinus murrayana* and *P. banksiana*.

The opinion is expressed that by suitable introduction of the best of these foreign species the yield from many German forests could be increased by 50 and in some cases by 100%. Still further increases are envisaged from the application of plant-breeding methods to the improvement of forest trees, both indigenous and imported.

Questions of habitat, management and forest improvement are treated in the third part; these include considerations of the best systems of felling, thinning and choice of species in relation to the various ecological conditions that obtain in different forest areas in Germany.

Jablokov, A. S.
Šlechtění dřevin se základy lesního semenářství. Část I. Genetika. (**The breeding of forest trees and the principles of forest seed husbandry. Part I. Genetics**).
Státní Zemědělské Nakladatelství; Praha 1954 : 16,90 Kčs. : Pp. 197 : figs.

The first volume of the recent Russian publication, *Selekcija drevesnyh porod s osnovami lesnogo semenovodstva* [*The breeding of forest trees and the principles of forest seed production*] by A. S. Jablokov, which was intended as a text book for forestry students at higher technical colleges in the USSR, has now been translated into Czech. It comprises a series of lectures on Mičurinist genetics as seen from the forester's point of view; the exposition is clear and easy to follow.

The work of rendering the Russian text into Czech was carried out collectively by members of the Faculty of Forestry at Brno. The same group of scientists are proposing to translate the second volume also, which deals with practical breeding work on forest trees.

8e beschrijvende rassenlijst voor groentegewassen (inclusief vroege aardappel, aardbei, tabak, geneeskrachtige en aromatische kruiden). [**Eighth descriptive variety list of vegetables (including early potatoes, strawberries, tobacco, and medicinal and aromatic herbs**)].
Inst. Vered. Tuinbouwgewassen, Wageningen 1956 : f. 1.75 : Pp. 168 : figs. : tables.

The above reference book, issued by the Institute for the Breeding of Horticultural Plants, Wageningen, once again attains the high standard to which one has become accustomed from its predecessors (cf. *PBA*, Vol. XXV, p. 458). The different crops are arranged in alphabetical order and the principal varieties of each crop described briefly and concisely. Information on diseases and disease resistance is also given. Selections included in the list of vegetables are accompanied by the name of the producer in order that users may know where the better selections are to be obtained. All varieties are indexed and ready reference thereby facilitated.

Tuinbouwgids 1956. (**Horticultural guide, 1956**).
Uitgave der Directie van de Tuinbouw, Den Haag 1956 : f 5 : Pp. 764 : figs. : plates.

The current edition of this valuable reference book for horticulturalists is the thirteenth of its kind (cf. *PBA*, Vol. XXV, p. 458) and has again been thoroughly revised. Subjects dealt with include fertilization, irrigation, drainage, plant pathogens and methods of combating them and the market garden industry in the Netherlands. Other sections are concerned with mechanical farming and varieties of fruit, vegetables, tobacco and ornamental plants grown in the country. Statistics are provided on, *inter alia*, working costs, meteorological conditions and the annual value of the industry to the national economy. A new series of coloured plates illustrating the damage caused by certain diseases and pests has been included and the impression gained is that the general standard of the illustrations has been improved even above that prevailing in previous editions. The four registers at the end of the book provide ready access to the wide range of information covered and many will find the list of research institutes and agricultural consultants in the Netherlands of particular interest.

LEHMANN, C.
Die Tomate. (**The tomato**).
Die neue Brehm-Bücherei, Leipzig und Wittenberg 1953 : DM 1.50 : Pp. 48 : 23 figs.

This short but attractively written and illustrated book on the history of the tomato is intended primarily for the layman and makes no claim to being a highly erudite work. It covers, however, a somewhat wider field than might be expected from its size and from the popular nature of the series of which it is part and includes much information of general interest. The author deals firstly with the commercial importance of the tomato in Europe and North America, presenting an account of the history of its introduction into Europe and later cultivation in North America and giving brief descriptions of all the more important varieties that have been bred in the last hundred years. The wide range of cultivated and semicultivated forms in Peru and other parts of the South American continent is then mentioned with reference to their value as breeding material in introducing early maturity, resistance to diseases and pests and other desirable characteristics into European and North American varieties. The systematics of the genus *Lycopersicon* is covered in some detail and the morphology of the leaves, flowers and fruit of the different botanical forms of *L. esculentum* discussed at length. It is concluded that *L. pimpinellifolium* is the original ancestral form of the cultivated tomato. The chemical composition and nutritive value of the tomato fruit are then discussed. A considerable part of the second half of the book is devoted to outlining current breeding objectives and to stressing the value of interspecific hybridization in achieving these aims. Among the more important breeding objectives listed are early maturity, improved resistance to diseases, insect pests and cracking, good transportability and attractive appearance of the fruit. The final section deals with diseases and pests to which the tomato is susceptible and methods of combating them. An appendix provides a key to the different species and botanical varieties of *Lycopersicon*.

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